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PSYCHOLOGICAL WELL-BEING AND PSYCHIATRIC DISORDERS IN 14- TO 15-YEAR-OLD FINNISH SCHOOL GIRLS AND BOYS WITH OVERWEIGHT AND OBESITY

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ACADEMIC DISSERTATION

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To my late parents

ABSTRACT

The psychological influence of obesity on health is less clear than the physical impacts. Further follow-up studies are needed to examine causality/directionality. To investigate psychiatric disorders in excess-weight adolescents, more studies with diagnostic interviews are required, because the results of previous studies have been contradictory, probably reflecting methodological differences. The aim of the study presented in this dissertation was to examine psychological well-being and psychiatric disorders linked to overweight and obesity in a general mid-adolescent population. The study population comprised 8th graders with Finnish as their mother tongue who attended normal education programs in secondary schools in Helsinki and consented to participate in the research project. The study was performed from 2003 to 2005, involving girls and boys aged approximately 14.5 years. The study population comprised 1370 students, of whom 659 were girls and 711 boys. The students completed self-assessments surveying self-esteem (RSES), their thoughts and ideas concerning eating behaviors (EDI), as well as their lifestyle. Both measured and self-reported weights and heights were recorded (Study I sample: 650 girls, 693 boys; Study II sample: 614 girls, 651 boys). A subgroup of adolescents (Study III subsample: 86 girls, 96 boys) was diagnosed by an adolescent psychiatrist using a semi-structured diagnostic instrument (K-SADS-PL). Furthermore, a subgroup (Study IV follow-up subsample: 78 girls, 88 boys) was followed up for one year and completed a questionnaire assessing the self-image (OSIQ-R**)** both at baseline and on follow-up.

In summary, psychological well-being was good in most of the overweight and obese adolescents. However, the excess-weight adolescents significantly more often revealed body dissatisfaction and other symptoms related to eating disorders ($p < 0.001$) and abnormal dietary behavior ($p < 0.001$) than their normal-weight peers. Adolescents with abnormal eating behavior reported significantly greater body dissatisfaction than those with normal eating behavior ($p < 0.001$). The excess-weight adolescents significantly more seldom reported experiences of dating than their normal-weight peers ($p < 0.001$). The boys with excess weight exercised significantly more seldom than their normal-weight peers ($p < 0.001$). The prevalence of lifetime and current psychiatric disorders did not significantly differ between the excess-weight and normal-weight adolescents. The prevalence of one or more current psychiatric disorders was 13.2% among adolescents with excess-weight. The self-image of girls with normal weight developed intensively during the one-year follow-up period compared to girls with excess weight ($p < 0.024$). The difference in change scores was largest in sexuality ($p = 0.018$) and vocational attitudes ($p = 0.041$), showing better self-image development among normal-weight girls than excess-weight girls, especially in these two component scales.

Key words: adolescence, overweight, obesity, psychological well-being, body satisfaction, self-esteem, self-image, Finland, school, population-based cohort

TIIVISTELMÄ

Ylipainoisten ja lihavien 14–15-vuotiaiden yläasteen tyttöjen ja poikien psykologinen hyvinvointi ja psykiatriset häiriöt

Lihavuuden vaikutukset fyysiseen terveyteen tunnetaan hyvin, mutta psykologiset vaikutukset ovat vähemmän tunnettuja. Syy-seuraussuhteiden tutkimiseen tarvitaan seurantatutkimuksia. Nuorten psykiatristen häiriöiden tutkimiseen tarvitaan enemmän diagnostisia haastatteluja, koska aikaisemmat tulokset vaihtelevat paljon todennäköisesti metodologisista syistä. Väitöskirjatyön tavoitteena oli tutkia ylipainoon ja lihavuuteen liittyviä psykologisia tekijöitä ja psykiatrisia häiriöitä keskinuoruusikäisessä yleisväestössä. Tutkimusaineiston muodostivat suomea äidinkielenään puhuvat, normaaliin perusopetuksen piirissä opiskelleet, tutkimusluvan antaneet helsinkiläiset, peruskoulun 8-luokkalaiset koululaiset. Aineisto kerättiin vuosina 2003–2005. Aineiston kooksi muodostui 1370 oppilasta (keski-ikä 14,5 vuotta), joista 659 oli tyttöjä ja 711 poikia. Oppilaat täyttivät koulutunnilla kyselylomakkeen, jonka avulla kartoitettiin nuorten itsetuntoa (RSES) sekä kehonkuvaan ja syömiskäyttäytymiseen liittyviä ajatuksia, asenteita ja toimintatapoja (EDI) sekä elämäntapoja. Nuoret arvioivat painonsa ja pituutensa, minkä lisäksi kouluterveydenhoitajat punnitsivat ja mittasivat heidät (tutkimus I otos: 650 tyttöä, 693 poikaa; tutkimus II otos: 614 tyttöä, 651 poikaa). Osa nuorista (tutkimus III osaotos: 86 tyttöä, 96 poikaa) osallistui nuorisopsykiatrian erikoislääkärin suorittamaan puolistrukturoituun diagnostiseen haastatteluun (K-SADS-PL). Osaa nuorista (tutkimus IV seurantaosaotos: 78 tyttöä, 88 poikaa) seurattiin vuoden ajan ja he täyttivät minäkuvaa kartoittavan kyselylomakkeen (OSIQ-R**)** seurannan alussa ja lopussa. Yhteenvetona voidaan todeta, että valtaosalla ylipainoisista ja lihavista nuorista psykologinen toimintakyky oli hyvä. Heillä oli kuitenkin merkitsevästi useammin ongelmia kehonkuvassaan ja kliiniseen syömishäiriöön viittaavia oireita ($p < 0{,}001$) ja vääristyneitä ruokailutottumuksia ($p < 0{,}001$) kuin normaalipainoisilla ikätovereilla. Nuoret, jotka kuvasivat poikkeavaa syömiskäyttäytymistä, olivat merkitsevästi tyytymättömämpiä kehonkuvaansa kuin ne nuoret, joiden syömiskäyttäytyminen tuli esille tavanomaisena ($p < 0{,}001$). Ylipainoiset ja lihavat nuoret ilmoittivat seurustelleensa merkitsevästi harvemmin kuin normaalipainoiset ikätoverinsa ($p < 0{,}001$). Ylipainoiset ja lihavat pojat harrastivat liikuntaa merkitsevästi vähemmän kuin normaalipainoiset ikätoverit ($p < 0{,}001$). Ylipainoisilla ja lihavilla nuorilla ei ilmennyt normaalipainoisia ikätovereitaan useammin elämänaikaisia tai ajankohtaisia mielenterveyden häiriöitä. Heillä yhden tai useamman ajankohtaisen mielenterveyden häiriön esiintyvyys oli 13,2 %. Vuoden seurannassa normaalipainoisilla tytöillä minäkuvan havaittiin kehittyvän merkitsevästi paremmin ylipainoisiin ja lihaviin verrattuna ($p = 0{,}024$). Osa-alueista merkitsevimmät positiiviset erot ilmenivät seksuaalisessa ($p = 0{,}018$) ja ammatillisessa minäkuvassa ($p = 0{,}041$).

Asiasanat: keskinuoruusikä, ylipaino, lihavuus, psykologinen hyvinvointi, kehonkuva, itsetunto, omakuva, Suomi, koulu, väestöön perustuva kohortti

CONTENTS

ABBREVIATIONS

ADHD	Attention-Deficit/Hyperactivity Disorder
BMI	Body mass index
C-GAS	The Children's Global Assessment Scale
CDC	Centers for Disease Control and Prevention
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4th edition
EDI	The Eating Disorder Inventory
FTO	The fat mass and obesity-associated
HPA	Hypothalamic–Pituitary–Adrenal
ICD-10	International Classification of Diseases and Related Health Problems, 10th revision
IOTF	The International Obesity Task Force
ISO-BMI	BMI for Children
K- SADS- PL	The Schedule for Affective Disorders and Schizophrenia for School-Aged Children – Present and Lifetime version
NCS-A	The National Comorbidity Survey-Adolescent Supplement
OSIQ-R	The Offer Self-Image Questionnaire, Revised
QOL	Quality of life
RSES	The Rosenberg Self-Esteem Scale
SES	Socioeconomic status
SHPS	The School Health Promotion Study
SD	Standard deviation
WHO	World Health Organization

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following original publications, referred to in the text by their Roman numerals (I–IV):

I Mäkinen M, Puukko-Viertomies L-R, Lindberg N, Siimes MA, Aalberg V. Body dissatisfaction and body mass in girls and boys transitioning from early to mid-adolescence: additional role of self-esteem and eating habits. BMC Psychiatry 2012; 12: 35. doi:10.1186/1471-244X-12-35

II Mäkinen M, Lindberg N, Komulainen E, Puukko-Viertomies L-R, Aalberg V, Marttunen M. Psychological well-being in adolescents with excess weight. Nordic Journal of Psychiatry 2015; 69: 354-363. doi:10.3109/08039488.2014.986194

III Mäkinen M, Lindberg N, Viertomies-Puukko L-R, Aalberg V, Marttunen M. Life-time and current psychiatric disorders in non-referred Finnish adolescents with excess weight. Psychiatria Fennica 2013; 44: 32-44.

IV Mäkinen M, Marttunen M, Komulainen E, Terevnikov V, Puukko-Viertomies L-R, Aalberg V, Lindberg N. Development of self-image and its components during a one-year follow-up in non-referred adolescents with excess and normal weight. Journal of Child and Adolescent Psychiatry and Mental Health (CAPMH) 2015; 9:5. doi:10.1186/s13034-015-0038-7

1. INTRODUCTION

Adolescence is a period of life when individuals transfer from childhood and their biological, cognitive, psychological, and social characteristics become more adult-like (Blos, 1962; Richter, 1997; Christie and Viner, 2005). It is a period of intense physical growth and development in which the salience of body shape and physical appearance is perhaps greater than in any other developmental stage in life (Blos, 1962; Richter, 1997).

During the last decades the prevalence of overweight and obesity in adolescence has increased in most parts of the world (WHO, 2000). In the Nordic countries, the prevalence of overweight in adolescence has increased 2–3-fold since the 1970s and 1980s (Kautiainen, 2005). In Finland, according to the recent School Health Promotion Study 2013 (http://www.info.thl.fi/kouluterveyskysely), the prevalence of experienced overweight was 20% among 8th - grade boys and 13% among girls.

Overweight and obesity during the adolescent years are associated with many somatic health problems, including type 2 diabetes, hypertension and hyperlipidemia. The most common problems are, however, psychosocial (Dietz, 1998). These problems are important to identify in order to enhance the well-being of youngsters with overweight and obesity (Halfon et al., 2013).

As adolescent overweight and obesity comprise a highly significant public health problem, the need for effective prevention and weight loss programs has been widely recognized (WHO, 2000). Adolescence has been suggested to be one of the most vulnerable periods for the development of persistent obesity (Dietz, 1998), and it has been described as a critical developmental window for obesity prevention and intervention (Liechty and Lee, 2015). Lifestyle changes, including reduced caloric intake, decreased sedentary behavior, and increased physical activity, are recommended for prevention and treatment (Martin et al., 2014). In fact, most overweight adolescents are motivated to reduce their weight (Ojala et al., 2007), but unfortunately, no treatment, including diet, medication, or even surgery, has been found effective enough as a sole tool (Flodmark et al., 2004). Among adults, there is some evidence that subjective well-being variables influence success in weight loss (Teixeira et al., 2005), and a greater focus on these variables both in obesity prevention and weight management programs has been demanded (van Zutven et al., 2015). Obesity management programs directed to adolescents are often adapted from programs developed for children, most of them with a strong focus on the family, or are adapted versions of adult programs, not recognizing the specificities of this age group (Fonseca et al., 2014).

It is important to examine body satisfaction, self-esteem, self-image, eating habits, physical activity, and other psychosocial factors related to body weight, and this should benefit in the development of management programs specifically directed at adolescents.

2. REVIEW OF LITERATURE

2.1. ADOLESCENCE

Adolescence is a transitional stage from childhood into adulthood during which the individual undergoes many physiological, psychological, cognitive, and social changes. Adolescence is initiated by pubertal onset and can be divided into three periods: early adolescence (12–14 years), middle adolescence (15–16 years) and late adolescence (17–22 years) (Blos, 1962; Richter, 1997). Each of these periods has certain developmental tasks, which are the achievement of biological and sexual maturity, the development of personal identity, the development of intimate sexual relationships, and the establishment of independence and autonomy (Christie and Viner, 2005). During early adolescence rapid phycical changes and reassessment of the body image occur. Early adolescents may experience impulse control problems, and irritability, increased conflicts with the parents, and rapid changes in mood and interests are common. Changes in cognition, early moral concepts and early sexual orientation begin to occur at this age. However, adolescents are still attached to their parents and sexual fantasies are usually repressed (Sadock et al., 2004). In middle adolescence, most girls have completed the physical changes related to puberty, whereas boys are still maturing and gaining strength, muscle mass, and height, and are completing the development of sexual traits. Mid-adolescents may become stressed over school and test scores, they seek privacy and time alone, they are concerned about their physical and sexual attractiveness, and may complain that their parents prevent them from doing things independently. They seek friends who share the same beliefs, values, and interests. They explore romantic and sexual behaviors with others. They may also be influenced by peers to try risky behaviors such alcohol consumption and tobacco smoking. Cognitive and moral thinking continue to develop. Youths have a better understanding of complicated problems and they are better able to set goals and think in terms of the future. In late adolescence, stable and equal intimate relationships are possible. The adolescents have increasing involvement in a personal lifestyle, and in moral and ethical values (Erikson, 1968). They make decisions about professional and educational goals and leave home (Blos, 1962; Garnefski and Diekstra, 1996; Steinberg and Morris, 2001; Gutgesell and Payne, 2004).

2.2. PSYCHOLOGICAL WELL-BEING OF ADOLESCENTS

2.2.1. BODY SATISFACTION

Body satisfaction can be described as the subjective evaluation of one's figure or body parts (Presnell et al., 2004). Body image has been measured in many ways. The simplest measures use single questions or figure drawings of increasing size from which actual and ideal figures are selected (Wardle and Cooke, 2005). In three large population-based studies, the proportion of females reporting body dissatisfaction ranged from 24% to 46%, whereas the respective proportions of males varied between 12% and 26% (Neumark-Sztainer et al., 2002; Stice and Whitenton, 2002; Presnell et al., 2004). Among females, body satisfaction appears to either remain stable or decrease during adolescence (Rosenblum and Lewis, 1999; Jones, 2004). It has been suggested that puberty precipitates body dissatisfaction in girls because of increasing adipose tissue, which in turn moves them away from the current thin beauty ideal (Graber et al., 1994; Presnell et al., 2004). Findings from a study by Kelly et al. (2005) suggest the importance of providing a social environment that focuses on health and fitness, rather than on weight control, to increase adolescent girls' likelihood of being satisfied with their bodies. Most research has focused on body dissatisfaction among females. However, body dissatisfaction in males has been associated with poor psychological adjustment, eating disorders, steroid use, and exercise dependence, as well as other health behaviors (McCabe and Ricciardelli, 2004). Among males, body satisfaction has been reported to either increase or remain stable as they move towards adulthood (Rosenblum and Lewis, 1999; Jones, 2004). In a review by McCabe and Ricciardelli (2004), body satisfaction has consistently been found to be higher in males than in females at all ages.

2.2.2. SELF-ESTEEM

According to Rosenberg (1965), self-esteem is the direction of self-attitude, a favorable or unfavorable opinion of oneself. High self-esteem is the feeling that one is good enough. Individuals with high self-esteem respect themselves, and consider themselves worthy (Rosenberg, 1965). Perceived acceptance or rejection by others affects self-esteem especially strongly during adolescence (Leary et al., 1998). Dumont and Provost (1999) reported that low self-esteem is associated with avoidance as a coping style, while high self-esteem is associated with active problem-solving as a coping style. Many studies have reported an association between low self-esteem and psychiatric and substance use disorders in adolescence (Rosenberg, 1965; Lewinsohn et al., 1997; Schmitz et al., 2003; Richardson et al., 2012). Adolescent girls tend to exhibit poorer self-esteem than boys (Bolognini et al., 1996; Diseth et al., 2014; Van Damme et al., 2014). This was also observed in a

Finnish population-based study among mid-adolescent students (Väänänen et al., 2014). According to Väänänen et al. (2014), among Finnish mid-adolescent students, low self-esteem is associated with both symptoms of depression and social phobia.

2.2.3. SELF-IMAGE

According to Offer et al., (1981a, 1981b), self-image is the organization of an individual's perceptions of functioning and adjustment in different areas of his or her life. It is based on Erikson's (1959, 1968) theory of personality development and identity formation and Marcia's operationalized concept of identity (Marcia, 1966). Transitioning from early adolescence to mid-adolescence, the development of self-image is generally positive in healthy adolescents (Abramowitz et al., 1984). In adolescent populations, a negative self-image has been associated with low self-esteem (Petersen et al., 1984), difficulties at school (Hay, 2000), depression (Alfeld-Liro and Sigelman, 1998), and eating disorders (Steinhausen and Vollrath, 1993; Erkolahti et al., 2002; Forsén Mantilla et al., 2014). A population-based study among 1054 Finnish eight-graders attending normal secondary schools revealed that the self-image of the girls was significantly lower than that of the boys (Erkolahti et al., 2003). Furthermore, the authors reported a highly significant correlation between self-image and self-reported depressive symptoms.

2.2.4. PHYSICAL ACTIVITY

The strongest health benefit of physical activity for adolescents is improved psychological health (Sallis, 2000). Physical inactivity is, however, increasing among children and adolescents (Hohensee and Nies, 2014; Micklesfield et al., 2014). At least moderate activity, such as brisk walking for 30 to 60 minutes a day most days of the week, has been recommended for so-called average adolescents (Haennel and Lemire, 2002). According to the School Health Promotion Study (SHPS) (http://www.info.thl.fi/kouluterveyskysely) among 8th and 9th graders in secondary schools in 2013, the prevalence of Finnish students who reported to exercise at least once a week so that they became out of breath was 33% in girls and 32% in boys. One of the suggested reasons for decreased physical activity is that increased screen time, i.e. time spent watching television, playing digital games, or using a computer (Must and Tybor, 2005), has replaced more physically active behaviors (Coon and Tucker, 2002). According to the SHPS (http://www.info.thl.fi/kouluterveyskysely), the prevalence of adolescents with a screen time of four hours or more on weekdays was 22% in girls and 26% in boys.

2.2.5. SMOKING AND ALCOHOL USE

Unhealthy behaviors such as smoking and substance use often generally begin during adolescence (Armstrong and Costello, 2002; Mangerud et al., 2014). The rates of smoking are reported to have declined during recent years among adolescents (Schepis and Rao, 2005), but according to the SHPS in 2013, the prevalence of self-reported daily smoking was still 12% in Finnish girls and 15% in boys (http://www.info.thl.fi/kouluterveyskysely). Alcohol is the most commonly used intoxicant among adolescents, and drunkenness-oriented drinking in general represents a cause for considerable concerns worldwide (O'Malley et al., 1998; Johnston et al., 2012). According to the 2011 ESPAP Report measuring substance use among students in 36 European countries (Hibell et al., 2012), most of the 15- to 16-year-old adolescents had drunk alcohol at least once during their lifetime (Hibell et al., 2012). Among Finnish adolescents, the proportion was 80%. According to the SHPS in 2013, the prevalence of Finnish boys and girls who used alcohol so that they became "really drunk" at least once a month was 13% and 11%, respectively.

2.2.6. DIETARY HABITS

Free school lunch has been offered to all Finnish school-aged children and adolescents since 1948. This has been seen as a way to promote both social equality and healthy eating habits. The immediate positive effects of eating school lunch are observed in learning and concentration (Benton et al., 2003; Bellisle, 2004). Unfortunately, many Finnish mid-adolescent pupils tend to skip school lunch: according to the SHPS in 2013, the prevalence of students skipping school lunch was 35% in girls and 32% in boys. The family meal culture, encompassing values as well as practices, shapes young people's eating behaviors (de Wit et al., 2015). Regular family meals during adolescence contribute to the formation of healthy eating habits later in life (Burgess-Champoux et al., 2009; Martin-Biggers et al., 2014). According to a recent study by Lora et al. (2014), more frequent family meals increased the odds of positive social skills and engagement in school, and decreased the likelihood of problematic social behaviors in children. The benefits of having a family meal can, of course, be undermined if the family consumes fast food, watches television during the meal, or has a more chaotic atmosphere (Martin-Biggers et al., 2014). During recent decades, including in Finland, the tradition of families eating together has weakened, most probably because of a hectic lifestyle and microwaves, which make it easy to warm food. According to the SHPS, the prevalence of adolescents not eating family dinners was as high as 58% in girls and 52% in boys.

2.2.7. SOCIAL RELATIONS

Peer relationships comprise important social resources for adolescents. As adolescents make the transition to secondary schools, peer networks tend to increase (La Greca and Prinstein, 1999). In particular, best friends and romantic partners are important sources of social support (Lesch and de Jager, 2014). By the age of 16 years, the majority of adolescents report having had a romantic relationship (Carver et al., 2003). Adolescent girls typically have more close friends than boys and report more intimacy in their friendships (Urberg et al., 1995). Adolescent romantic relationships are similar to close friendships in that both involve support, intimacy, and companionship (Laursen, 1996). Distinctions also exist, as adolescents name passion, commitment, and sexual intimacy as characteristics specific only to romantic relationships (Connolly et al., 1999). The presence of a dating relationship protects adolescents against feelings of social anxiety (La Greca and Harrison, 2005), but on the other hand, the development of a romantic relationship is a new and potentially stressful social task, and many adolescents report distress (Neider and Seiffge-Krenke, 2001). Aversive experiences with peers and peer victimization, such as exclusion and aggression, are associated with internal distress, including feelings of depression and loneliness (La Greca and Harrison, 2005). According to the SHPS in 2013, the prevalence of Finnish students with no close friend was 6% in girls and 11 % in boys. The prevalence of being a victim of school bullying in Finnish secondary schools is approximately 6% in girls and 10% in boys (Luopa et al., 2008).

2.3. EPIDEMIOLOGY OF PSYCHIATRIC DISORDERS IN ADOLESCENCE

Adolescence is a risk period for the emergence of many mental health disorders (Kim-Cohen et al., 2003; Kessler et al., 2005). The incidence of psychiatric disorders increases from childhood through mid-adolescence and peaks in late adolescence and young adulthood (Newman et al., 1996). The emergence of certain psychopathologies is probably related to anomalies or exaggerations of typical adolescent maturation processes acting in concert with psychosocial factors and/or biological environmental factors (Paus et al., 2008).

The National Comorbidity Survey-Adolescent Supplement (NCS-A) is a nationally representative face-to-face survey of approximately 10 000 adolescents aged 13–18 years that was carried out in the United States (Merikangas et al., 2010). According to the DSM-IV criteria, the lifetime prevalence of anxiety disorders was 31.9%, behavior disorders 19.1%, mood disorders 14.3%, and substance use disorders 11.4%. Despite these high prevalence rates, however, the lifetime prevalence of disorders with severe impairment and/or distress was 22.2% (11.2% with mood disorders; 8.3% with anxiety disorders; 9.6% with behavior disorders) (Merikangas et al., 2010). In the

same sample, the lifetime prevalence estimates of anorexia nervosa, bulimia nervosa, and binge-eating disorder were 0.3%, 0.9%, and 1.6%, respectively (Swanson et al., 2011). Costello et al. (2011) reviewed both cross-sectional and longitudinal studies published in the past 15 years in papers reporting prevalence rates of psychiatric disorders separately for childhood, adolescence, and early adulthood. According to their review, about one adolescent in five suffers from a psychiatric disorder. Drug abuse and drug dependence were the most common diagnosis groups (12.1%), followed by anxiety disorders (10.7%), depressive disorders (6.1%), and behavioral disorders (conduct disorder, oppositional defiant disorder, or ADHD) (3.5%) (Costello et al., 2011). The prevalence of schizophrenia-related disorders in adolescence is about 1–2 % (Kessler et al., 1994; Patel et al., 2007). The prevalence of rare disorders (those with a point prevalence of less than 1%) is diffcult to estimate unless the samples are very large, which few adolescent epidemiological samples are (Costello et al., 2011). The British Child and Adolescent Mental Health Survey 1999 (n = 10 438) reported pervasive developmental disorders in 0.2% of youths aged 11–15 years (Ford et al., 2003). Nothing in the literature suggests any dramatic secular changes in overall rates of adolescent psychiatric disorder, although there is some evidence that the prevalence of conduct disorder symptomatology may have increased both among girls and boys (Collishaw et al., 2004; Costello et al., 2011).

2.3.1 FINNISH EPIDEMIOLOGICAL STUDIES ON PSYCHIATRIC DISORDERS IN ADOLESCENCE

There have been no representative general population-based epidemiological studies of adolescent psychiatric disorders based on diagnostic interviews in Finland (Väänänen, 2015).

The Finnish 1981 Birth Cohort Study (n = 5346) investigated subjects aged 13–24 years who were admitted to psychiatric hospital for any reason (Gyllenberg et al., 2010). Females were admitted for non-psychotic mood disorders (1.9%) and psychotic disorders (0.8%). The subdiagnoses of psychotic disorders among females were affective psychoses (0.4%), schizophrenia (0.2%), and psychotic disorder not otherwise specified (0.2%). Respectively, males were admitted to hospital for substance-related disorders (1.8%) and psychotic disorders (1.5%). The subdiagnoses of psychotic disorders were non-affective psychoses (1.3%), schizophrenia (0.6%), and psychotic disorder not otherwise specified (0.8%). Overlapping of diagnostic groups was noticed because of the different primary diagnoses used for some subjects in different admissions (Gyllenberg et al., 2010).

In the general population-based Northern Finland 1986 Birth Cohort (n = 6274), the cumulative incidence of new hospital treated non-psychotic disorders

was 1.4% and that of psychoses was 0.4% (altogether, 1.8% of hospital-treated mental disorders) in patients aged 17 to 23 years (Mäki et al., 2014).

The School Health Promotion Study (SHPS), a general population study, monitors the health and well-being of Finnish 14–20-year-old adolescents by using self-report questionnaires in schools (http://www.info.thl.fi/kouluterveyskysely). At present, the SHPS is carried out nationwide every second year, but before 2013 the study was implemented in one half of Finland in even-numbered years and in other half of the country in odd-numbered years. Approximately 200 000 students participate in the study. The participation rate is nearly 80% of the age group in comprehensive schools (13–15 years) and 70% in upper secondary schools (16–17 years). In 2013, the prevalence of strong anxiety was 16% among girls and 6% among boys in comprehensive schools (http://www.info.thl.fi/kouluterveyskysely).

The Adolescent Mental Health Cohort study was a two-year Finnish follow-up study (n = 2070) conducted at baseline in the 9th grades of all Finnish-speaking comprehensive schools of two cities, and on follow-up in secondary schools. The mean age at baseline was 15.5 years and on follow-up 17.6 years. Participants completed a printed questionnaire during a school lesson (Väänänen, 2015). One out of ten girls and 7.5% of boys had social phobia at the age of 15 years, and the prevalence increased at the age of 17 years in both genders. In girls, depression had the same prevalence as social phobia at the age of 15 years, but it did not increase at 17 years of age. In boys, the prevalence of depression was somewhat less common than social phobia at 15 years, and it increased slightly until the age of 17 years (Väänänen, 2015).

2.4. OVERWEIGHT AND OBESITY IN ADOLESCENCE

2.4.1. DESCRIPTIONS OF OVERWEIGHT AND OBESITY

The World Health Organization (WHO) defines obesity as a level of body fatness sufficiently high to increase the risk of morbidity or mortality (WHO, 2000). The body mass index (BMI; the body weight in kilograms divided by the square of the height in meters [kg/m^2]) is the most widely used measurement to reflect the degree of excess body weight. BMI may be a valid measure of adipose cover among adolescents (Pietrobelli et al., 1998). It shows, however, significant variations during childhood and adolescence, and age- and gender-specific reference standards must be used in under-aged populations. Different cut-off points are used in the USA and in Europe, which makes statistical comparisons difficult (Flodmark et al., 2004).

In the USA, the Centers for Disease Control and Prevention (CDC) have developed sex- and age-specific growth charts, which include an age- and sex-specific BMI reference for children and adolescents aged from 2 to 20 years (Centers for Disease Control and Prevention, 2000, http://www.cdc.gov). Data from five national health

surveys carried out between 1963 and 1993 together with five supplementary sources of data served as the reference population for developing for these curves. Each of the CDC BMI-for-age gender-specific charts contains a set of curved lines indicating specific percentiles (Lahti-Koski and Gill, 2004). Based on the specific percentiles, the definitions for children and adolescents being underweight, at risk of overweight and overweight are as follows:

Underweight	BMI-for-age < 5^{th} percentile;
At risk of overweight	BMI-for-age 85^{th} to < 95^{th} percentile;
Overweight	BMI-for-age ≥ 95^{th} percentile.

The terms "at risk of overweight" and overweight used in child and adolescent populations equate with the terms overweight and obesity in adulthood.

Some countries have developed their own BMI-for-age reference charts, including the UK, the Netherlands, Italy, France, Finland, Sweden, and Hong Kong, China (Lahti-Koski and Gill, 2004; Saari et al., 2011). The cut-off points of the 85^{th} and 95^{th} percentiles to define children and adolescents with weight problems are most commonly used.

In 1997, members of a workshop organized by the International Obesity Task Force (IOTF) sought to establish a reasonable index with which to assess adiposity in children and adolescents worldwide, and they proposed a scheme for cut-off points for children and adolescents based on internationally accepted BMI cut-off points for adult morbidity of 25 and 30 kg/m^2. The use of these cut-off points was intended provide a new approach to identifying childhood obesity and make the definition for children and adolescents consistent with that for adults (Bellizzi and Dietz, 1999).

Age- and sex-specific cut-off points for BMI related to overweight and obesity were developed by using dataset-specific centiles linked to adult cut-off points. Data for development were obtained from six large nationally representative cross-sectional surveys on growth from Brazil, Great Britain, Hong Kong, the Netherlands, Singapore, and the United States (Cole et al., 2000). For each of the surveys, centile curves were drawn such that they passed through cut-off points of 25 kg/m^2 for adult overweight and 30 kg/m^2 for adult obesity at age of 18 years. Averaging the curves from different surveys provided the age- and sex-specific BMI cut-off points for overweight and obesity from 2 to 18 years. These cut-off points were tabulated at exact half-year ages. The cut-off points were recommended for use in international comparisons of the prevalence of overweight and obesity among children and adolescents. However, these cut-offs are not recommended for clinical use when assessing an individual child's growth (Cole et al., 2000).

The international cut-off points have been compared with national definitions. In a review by Reilly et al. (2010), the national approach was compared to the

IOTH approach. In five out of a total of eight studies, accuracy was reported to be significantly higher using national reference data and percentiles (significantly higher sensitivity). In three out of the eight studies, accuracy did not differ between these two approaches. In seven studies, the specificity of the two approaches was formally compared; specificity was high in both approaches and did not differ from each other. In summary, the review stated that the IOTF approach is of great value in international comparisons of obesity prevalence, not least because in many nations national reference data for BMI for age are not available.

Saari et al. (2011) have constructed new Finnish growth curves and defined the BMI cut-off points for obesity, overweight, and various grades of thinness in Finnish children and adolescents based on BMI values of 30, 25, 18.5, 17, and 16 kg/m^2 in adults. Mixed cross-sectional/longitudinal data on 73 659 healthy subjects aged 0–20 years (born 1983–2008) were collected from providers in the primary health care setting. Based on these height and weight data, Finnish BMI values for children (ISO-BMI) aged 2–18 years have been calculated using certain coefficients, which convert the BMI of the child to the corresponding adult BMI (Dunkel et al., 2015). There are several advantages in using the updated and new references. For instance, use of the new references should result in fewer misclassifications of normal growth as well as thinness, overweight, and obesity in children and adolescents (Saari et al., 2011).

2.4.2. PREVALENCE OF ADOLESCENT OVERWEIGHT AND OBESITY

The prevalence of adolescent overweight and obesity has been increasing in most parts of the world during the last three decades (Lobstein and Frelut, 2003; Lissau et al., 2004; Kautiainen, 2005). Reported prevalence rates are, of course, dependent on the cut-off points used in the study. In the Health Behavior in School-Aged Children Study, Janssen et al. (2005) compared the prevalence of overweight and obesity among school-aged youths in 34 countries. The data consisted of a cross-sectional survey of altogether 137 593 10- to 16-year-old adolescents primarily from European countries. The prevalence of overweight and obesity was determined based on self-reported height and weight and the IOTF reference was used. The two countries with the highest prevalence of overweight and obese youths were Malta (25.4% and 7.9%) and the USA (25.1% and 6.8%), while the two countries with the lowest prevalence rates were Lithuania (5.1% and 0.4%) and Latvia (5.9% and 0.5%). The prevalence of overweight and obesity was particularly high in North America, the UK, and southwestern Europe. The prevalence of overweight youths was between 10% and 15% in the Nordic countries (Denmark, Finland, Norway, Sweden) (Janssen et al., 2005). In Finland, studies have also revealed an increasing trend of overweight and obesity among adolescents (Kautiainen et al., 2002; Kautiainen et al., 2009).

Kautiainen et al. (2009) reported that the prevalence of overweight and obesity among Finnish 12- to 18-year-old adolescents had increased three-fold during the previous three decades. In this study, BMI was calculated from self-reported weight and height data, and overweight and obesity were defined according to the IOTF reference for children. In the SHPS in 2013, Finnish 8th and 9th graders were asked if they were overweight. As many as 20% of the boys and 13% of the girls reported being overweight (http://www.info.thl.fi/kouluterveyskysely).

During recent years, evidence has emerged from several countries suggesting that the rise in the prevalence of overweight and obesity has appreciably slowed, or even plateaued (Rokholm et al., 2010; Olds et al., 2011). Rokholm et al. (2010) investigated the possible leveling off in the obesity epidemic by systematically reviewing the literature and web-based sources. A literature and Internet search resulted in 52 studies from 25 different countries. The findings supported an overall leveling off of the epidemic in children and adolescents from Australia, Europe, Japan, and the USA. The leveling off was less evident in the groups with a low family socioeconomic status. No obvious differences between genders were identified. According to the review, however, it is important to emphasize that the leveling off does not imply the end of the epidemic. An issue rarely addressed in the literature is the evidence for a non-linear, stepwise increase in the prevalence of obesity over time. In essence, there is no guarantee that the current stability will last and that the prevalence will not increase again in the future. Therefore, research into the causes, prevention, and treatment of obesity should remain a priority (Rokholm et al., 2010).

2.4.3. EARLY RISK FACTORS FOR OVERWEIGHT AND OBESITY

Obesity is a complex disorder affected by several genetic and non-genetic factors and the interactions between many of these (Han et al., 2010). The identification of risk factors is important in prevention. However, nearly all known risk factors are potential rather than confirmed (Reilly et al., 2005). Putative factors in early life that could be associated with obesity at the age of 7 years were examined in a cohort study including approximately 8200 children (Reilly et al., 2005). The study supported the importance of the environment in early life in association with the risk of later obesity. An increased prevalence of obesity at the age of 7 years was associated with a high birth weight, while the risk of obesity at age 7 was linearly associated with the obesity of one or both parents. A shorter sleep duration in children aged 30 months was independently associated with the prevalence of obesity at the age of 7. The obesity risk increased linearly with a greater number of hours spent viewing television. Early adiposity or body mass index rebound was also independently associated with obesity at 7 years of age (Reilly et al., 2005). The relationship between obesity and the socioeconomic status (SES) has also

been investigated. Lissau and Sørensen (1992) carried out a 10-year follow-up of approximately 750 Danish 9- to 10-year-old children. Their aim was to prospectively assess the influence of social factors in childhood on body weight in young adulthood, while taking into account the degree of adiposity in childhood. Education and the occupation of the parents was inversely correlated with the body weight of their children in adulthood. However, the area where the children were reared had a much stronger impact on the risk of overweight in young adulthood than parental education and occupation (Lissau and Sørensen, 1992).

The cross-sectional association between SES and obesity has been described in school-aged children from Western developed countries in epidemiological studies since 1989. Forty-four studies were included in a review, which concluded that the association between SES and obesity in children and adolescents was predominately inverse. In particular, children whose parents had a low level of education appeared to be at higher than average risk of obesity (Shrewsbury and Wardle, 2008). The persistence of obesity from childhood to adolescence is high. Nader et al. (2006) found in the USA that three in five children who were overweight at any time during the preschool period and four in five children who were overweight at any time during the elementary period were overweight when they were aged 12 years.

2.4.4. COURSE AND OUTCOME OF ADOLESCENT OVERWEIGHT AND OBESITY

Wardle et al. (2006) found in a five year longitudinal cohort study in London of approximately 5900 students that persistent obesity is established before age 11. Adolescent overweight and obesity have tends to persist into adulthood (Serdula et al., 1993; Reilly et al., 2003; Singh et al., 2008). In their review, Sing et al. (2008) found that the percentage of overweight adolescents who became overweight adults varied between 22% and 58%, while the percentage of obese adolescents who became overweight or obese adults respectively varied between 24% and 90%. Some studies have reported a stronger persistence for girls than for boys, but contrasting findings have also been presented (Singh et al., 2008).

Childhood and adolescence overweight and obesity have a number of adverse consequences for both physical and mental health. According to a systematic review by Reilly and Kelly (2011), childhood and adolescent overweight and obesity are associated with a significantly increased risk of cardio-metabolic morbidity (diabetes, hypertension, ischemic heart disease, and stroke), disability pension, asthma, sleep problems, and polycystic ovary syndrome symptoms in adulthood. Furthermore, child and adolescent overweight and obesity significantly increase the risk of premature mortality. Fontaine et al. (2003) concluded that obesity appears to lessen life expectancy, especially among younger adults compared to older adults. The maximum years of lost life due to obesity for white men aged 20 to 30 years

with a severe level of obesity (BMI > 45) is 13, while the respective figure for white women is 8.

Childhood and adolescent overweight and obesity have also mental health, social, and economic consequences. According to the longitudinal Northern Finland 1966 Birth Cohort Study (Herva et al., 2006), obesity at 14 years associated with depressive symptoms at 31 years. Furthermore, a recent follow-up study performed in Great Britain reported that childhood and adolescent obesity predicted subsequent depressive symptoms in adult females (Geoffroy et al., 2014). In a follow-up study by Gortmaker et al. (1993), adolescent overweight and obesity related to a lower educational level, being unmarried, and lower household incomes in adulthood among females, and respectively to being unmarried among males.

2.5. PSYCHOLOGICAL WELL-BEING IN ADOLESCENTS WITH OVERWEIGHT AND OBESITY

2.5.1. QUALITY OF LIFE (QOL)

According to a recent systematic review by Buttita et al. (2014), most dimensions of quality of life (QOL) are affected in overweight and obese adolescents. The risk of impaired QOL is greater in clinical than general populations of overweight and obese youths. Impairment in QOL worsens with the degree of obesity, and it is more pronounced in girls than in boys.

2.5.2. BODY SATISFACTION

According to a review by Ricciardelli and McCabe (2001), there are consistent findings of a relationship between body dissatisfaction and BMI, particularly in girls. Correspondingly, Wardle and Cooke (2005) reported that levels of body dissatisfaction are higher in community samples of overweight and obese children and adolescents than in their normal-weight counterparts. Braet et al. (2004) reported that body dissatisfaction was significantly reduced in 7- to 17-year-olds during 10 months of inpatient treatment for obesity, and remained significantly lower than that at baseline at a 14-month follow-up. Neumark-Sztainer et al. (2006a) found that, in general, lower body satisfaction predicts the use of behaviors that may place adolescents at risk for weight gain and poorer overall health. Interventions with adolescents should strive to enhance body satisfaction and avoid messages likely to lead to decreases in body satisfaction.

2.5.3. SELF-ESTEEM

A review by French et al. (1995) comprised 35 studies on the relationship between self-esteem and obesity in children and adolescents. Thirteen of 25 cross-sectional studies reported lower self-esteem in obese samples. The results from two prospective studies examining initial self-esteem and later obesity were inconsistent, while the results from six of eight weight loss treatment studies demonstrated that weight loss improved self-esteem. Relationships between self-esteem and BMI were more consistent in adolescents than in children. According to Wardle and Cooke (2005), studies based on clinical samples typically report poorer self-esteem in treatment seekers when compared with population-based samples. Furthermore, many studies have examined girls alone, reflecting the assumption that cultural norms of slimness may more seriously affect aspects of the self-esteem of girls.

2.5.4. SELF-IMAGE

Overweight girls have been reported to have more problems with their sexual self-image and more psychopathology than their peers with normal weight (Pisk et al., 2012). One aspect of self-image is body image, the perception of and attitude towards one's own body. Distortion of the body image strongly associates with overweight and obesity problems (Smolak, 2004; Bibiloni et al., 2013; Megalakaki et al., 2013). According to a study by Farhat et al. (2014), body image even mediated the relationship of obesity with infrequent breakfast consumption, smoking, and lack of physical activity. Furthermore, in a study by Reulbach et al. (2013), body image among 9-year-old children exhibited a stronger association with victimization of bullying than the objective BMI-derived weight classification. Furthermore, perceived weight rather than obesity increased the risk of major depression among adolescents (Roberts and Duong, 2013). Although the findings are not entirely consistent, many studies on weight loss programs have reported improvements in body image (Blaine et al., 2007).

2.5.5. PHYSICAL ACTIVITY

Janssen et al. (2005) examined associations between overweight and physical activity patterns. The data consisted of a cross-sectional survey of almost 140 000 youths from 34 countries. Within most countries, physical activity levels were lower and television-viewing times were higher in overweight compared to normal-weight youths. The available evidence from prospective observational studies suggests that both increased physical activity and decreased sedentary behavior are protective against relative weight and fatness gains during adolescence (Must and Tybor, 2005).

2.5.6. SMOKING AND ALCOHOL USE

Among adolescents, smoking for weight control has been reported to be prevalent (French and Perry, 1996; Crisp et al., 1998). According to a study by Cawley et al. (2014), among American teenagers who smoke frequently, 46% of girls and 30% of boys reported smoking to control their weight. In particular, adolescent smokers who perceive themselves as overweight or obese often report smoking as a weight control method (Fulkerson and French, 2003; Cawley et al., 2014). According to a study by Lanza et al. (2014), overweight and obese adolescents are at higher risk of engaging in regular smoking. There is evidence, in fact, that smoking increases energy expenditure by raising the metabolic rate (Chiolero et al., 2008). Moreover, nicotine suppresses appetite (Chiolero et al., 2008; Mineur et al., 2011). The health risks of smoking are, however, so enormous, that public health policy is targeted at reducing smoking in all age and weight groups. The caloric value of alcohol is high, and a positive association between alcohol consumption and body weight has been detected in the adult population (Lahti-Koski et al., 2002). Neumark-Sztainer et al. (1997) noted that among American adolescents, substance use was equally or less prevalent among those with overweight compared to among those with normal weight. In particular, girls with overweight reported using alcohol less often than their normal-weight peers. Accordingly, in a study by Lanza et al. (2014), adolescent overweight and obesity were not associated with problematic alcohol use. Contrary to these results, Croezen et al. (2009) reported that among Dutch 15- to 16-year-old students, alcohol consumption was positively related to overweight and obesity.

2.5.7. DIETARY HABITS

An inverse association between meal frequency and the prevalence of obesity in adolescence has been reported (Mota et al., 2008). Breakfast skipping, which seems to be more prevalent among girls than boys (Croezen et al., 2009), is linked to an increased prevalence of adolescent overweight and obesity (Croezen et al., 2009; Huang et al., 2010). Frequent family meals have been associated with higher adolescent fruit and vegetable intake, lower fast food consumption, and a lower BMI score (Berge et al., 2015). Family meals also seem to be protective against the development of overweight and obesity in young adulthood (Berge et al., 2014). Overall, skipping meals is not an optimal way to try to lose weight, since it actually predicts weight gain (Neumark-Sztainer et al., 2006b).

2.5.8. SOCIAL RELATIONS

Overweight and obese adolescents have been described as socially marginalized. They have been reported to have fewer friends and be at greater risk of mistreatment by peers (Strauss and Pollack, 2003). Puhl et al. (2013) reported that as many as 64% of students had weight-based victimization or bullying at school, and the risk of it increased as a function of body weight. In a systematic review, a higher level of peer victimization among children and adolescents with chronic conditions, including overweight, was demonstrated (Sentenac et al., 2012).

Pearce et al. (2002) found that obese girls were less likely to date than their peers, and that both obese girls and boys reported being more dissatisfied with their dating status than their normal-weight peers. The authors speculated that adolescents with obesity might have fewer opportunities to date, because psychological and health difficulties frequently associate with obesity.

2.6. PSYCHIATRIC COMORBIDITY IN ADOLESCENTS WITH OVERWEIGHT AND OBESITY

Although psychosocial correlates of overweight and obesity have been extensively studied, research performed using structured clinical interviews, currently seen as the "gold standard" for the assessment of psychiatric disorders (Costello et al., 2005), is scarce. The results have been inconsistent, probably reflecting both methodological differences between studies and differences within study populations.

In a clinical study by Vila et al. (2004), 58% of children and adolescents with overweight and obesity showed current psychiatric disorders. The most common disorders were at least one anxiety disorder (32%), such as social phobia, generalized anxiety disorder, and separation anxiety disorder. 12% of the sample met the criteria for an affective disorder and 16% for a disruptive behavior disorder. The prevalence of psychiatric disorders was compared between referred and non-referred children and adolescents with overweight by Van Vlierberge et al. (2009). They reported that 37.5% of the participants in the referred group and 23.3% of the non-referred group suffered from at least one psychiatric disorder. The proportion of anxiety disorders was highest in both groups (referred 16.2% / non-referred 13.7%), followed by mood disorders (8.0% / 6.9%), and disruptive behavior disorders (8.0 % / 6.9%). The presence of eating disorders was largely restricted to the referred youngsters (11.4% / 1.4%). In contrast, Lamertz et al. (2002) found no association between BMI and mental disorders in a community survey with more than 3000 adolescents and young adults aged 14 to 24 years. Accordingly, Mustillo et al. (2003) found that the percentage of overweight youngsters who met the criteria for a current psychiatric disorder was low, being, for example, 3.0% for mood disorders, 1.1% for anxiety disorders, 3.7% for oppositional defiant disorder, 1.4 % for conduct disorder, and

0.9% for ADHD in a follow-up study on a community sample of 9- to 19-year-old adolescents.

2.7. THEORIES CONNECTING PSYCHOLOGICAL WELL-BEING, PSYCHIATRIC DISORDERS, AND OBESITY

The physical consequences of obesity for health are well known, but the influence on psychological well-being is less clear (Wardle and Cooke, 2005). An association between psychological well-being and overweight and obesity exists, but causality/directionality is still unclear (Zametkin et al., 2004). In a review of 51 articles, the majority of studies demonstrated a relationship between childhood and adolescent obesity and depression. The studies also showed that childhood depression leads to future obesity. Depression was related to increased actual body weight, but this association is also mediated through perceived body weight and body dissatisfaction (Yagnik et al., 2014). In a meta-analysis based on studies including adult and adolescent participants, a reciprocal link between depression and obesity was confirmed. Obesity increased the risk of depression, while in addition, depression was predictive of developing obesity (Luppino et al., 2010). New evidence suggests that children and adolescents with selected chronic conditions may be predisposed to overweight and obesity. Chen et al. (2009) analyzed reported height and weight and the corresponding BMI from approximately 46 700 children and adolescents aged 10–17 years in the USA. Their findings suggest that subjects with selected chronic conditions were at increased risk of obesity compared to those without a chronic condition. The authors found that the prevalence of obesity without a chronic condition was 12.2%, while the prevalence was 18.9% for subjects with ADHD, 19.3% for those with developmental conditions such as learning disability, 23.4% for those with autism, and 19.7% for those with a physical condition such as asthma (Chen et al., 2009). According to a recent systematic review by Pulgarón (2013), major psychological comorbidities of childhood overweight and obesity include internalizing and externalizing disorders, ADHD, and sleep problems. There is evidence of behavioral problems in subgroups of obese adolescents, but there is no clear indication of higher rates of psychiatric comorbidity in the general population of obese adolescents (Zametkin et al., 2004). Research has been suggested to identify protective and risk factors impacting on the development of psychopathology in overweight and obese persons. Attention should move from whether excess-weight persons have psychological problems to who will have and how (Friedman and Brownell, 1995).

2.7.1. PSYCHOLOGICAL THEORIES ON OBESITY AND PSYCHOLOGICAL WELL-BEING

The psychodynamic theory of obesity is an old and also controversial model of obesity (Slochower, 1987). On the other hand, recent neuropsychiatric research and imaging technology have supported the main psychodynamic concepts such as the unconscious and the prominent role of early life events (Bornstein et al., 2006b). Psychodynamic theories include two central explanations concerning obese persons. First, unconscious conflicts may lead to overeating. These conflicts may be caused by difficulties in personality development. Second, emotional stress such as anxiety or depression, as a response, may cause overeating. The psychodynamic description of an obese individual includes dependence problems and poor coping capacity (Bruch, 1973; Striegel-Moore and Rodin, 1986). Slochower (1987) emphasized that the psychodynamic theory of obesity does not contradict with genetic and/or physiological factors very probably having an impact on obesity. Psychodynamic therapy is less frequently used for the management of obesity than for eating disorders (Flodmark and Lissau, 2002). Behavioral therapy for obesity is based on the idea that obesity is a learned disease and potentially curable by relearning (Flodmark and Lissau, 2002). In the treatment of obesity, by combining cognitive and behavioral therapy, through practice and reward, changes in a person's cognitive processing may lead to behavioral changes (Flodmark and Lissau, 2002). However, according to a review of the literature, the differences between behavior therapy and cognitive-behavioral therapy for obesity exist more in their underlying theories than in their implementation (Fabricatore, 2007).

2.7.2. BIOLOGICAL ASPECTS OF OBESITY AND PSYCHIATRIC DISORDERS

Several cohort studies on adults have shown an inverse relationship between BMI and completed suicide, suggesting a protective effect of increasing BMI against completed suicide (Magnusson et al., 2006; Kaplan et al., 2007; Perera et al., 2015). This is surprising, because the psychosocial stigma and medical comorbidities associated with obesity have been considered as potential risk factors for suicide. The association between BMI and attempted suicide is inconsistent, with several studies reporting both positive and negative relationships between them (Perera et al., 2015). There are many possible explanations for the BMI–suicide association. One theory is based on serotonin: Low BMI is related to low serum cholesterol levels, which may lead to reduced brain serotonin and an increased risk of suicide (Magnusson et al., 2006). Batty et al. (2010) noted that the inverse relationship was strongest with those suicide methods generally requiring greater physical exertion

and agility, such as hanging and jumping. These methods might be less likely to be used by those with a higher BMI.

The stress-related neuroendocrine system is known as the hypothalamic–pituitary–adrenal (HPA) axis, which appears to play an important role in the shared biology of depression and obesity (Bornstein et al., 2006b). Both disorders may feature dysregulation, and hyperactivation of the HPA axis with hypercortisolemia. The shared biology does not mean an identical mechanism of disease, but rather that the systems interact. Bornstein et al. (2006b) proposed large-scale population studies on gene–environment interactions to examine the shared biology of common and complex diseases whose biology may at least partly overlap.

Obesity is an inflammatory condition. Numerous of biomarkers of inflammation, including inflammatory cytokines, have been found in fat cells. These are involved in fat metabolism and have been observed to be positively related with all indices of obesity, especially abdominal obesity (Haroon et al., 2012; Berk et al., 2013). The potential contribution of chronic inflammation to the development of depression has received increasing attention. Elevated biomarkers of inflammation, i.e. inflammatory cytokines, have been found in depressed patients, and the administration of inflammatory stimuli has been associated with the development of depressive symptoms (Haroon et al., 2012). Cross-sectional and prospective studies indicate that obesity, independent of age and other potential confounders, leads to altered levels of inflammatory cytokines, providing a likely explanation for the observed increases in concomitant disease, including depression (Berk et al., 2013).

Leptin is a peptide hormone, an adipose-derived hormone that signals satiety. Recent pharmacological studies suggest that leptin may have antidepressant and anxiolytic efficacy (Lu, 2007; Lawson et al., 2012). Obesity is commonly characterized by high levels of leptin. The high leptin levels associated with obesity are thought to be caused by leptin resistance (Lu, 2007; Lawson et al., 2012). Leptin treatment is ineffective in inhibiting food intake and increasing energy expenditure in obese people, whereas leptin in normal-weight people leads to a reduction in adipose tissue and weight loss. Considering the ability of leptin to inhibit depressive behaviors in animal models, leptin resistance may contribute to the higher rate of depression in obese people (Lu, 2007). An open question is whether leptin resistance serves as a common biological factor for the comorbidity of obesity and depression (Lu, 2007).

2.7.3. SHARED GENE–ENVIRONMENT INTERACTION BETWEEN OBESITY AND PSYCHIATRIC DISORDERS

The heritability of obesity and body weight is mostly high. The genetic predisposition to obesity in general has a polygenic basis (Hinney et al., 2010). A polygenic variant by itself has a small effect on the phenotype; only in combination with

other predisposing variants does a fairly large phenotypic effect arise. Pathway analyses provide powerful support for the role of the central nervous system in obesity susceptibility (Locke et al., 2015). There is increasing evidence of shared genetic factors that may result in obesity and psychiatric disorders (Scherag et al., 2010; Afari et al., 2010; Walter et al., 2015). Scherag et al. (2010) expected that some of the gene variants that predispose to obesity will also influence genetic vulnerability to eating disorders. Afari et al. (2010) concluded that the relationship between depression and obesity may, especially in women, be partly due to the shared genetic risk for both conditions. Gene–environment interaction should be examined in future studies on this issue. Recent findings reported by Walter et al. (2015) suggest that genes influencing obesity, e.g. the fat mass and obesity-associated (FTO) gene, may have a direct impact on phobic anxiety, and obesity and phobic anxiety might have shared genetic determinants.

2.8. SUMMARY OF THE REVIEWED LITERATURE

In middle adolescence, most girls have completed the physical changes related to puberty, whereas boys are still maturing and gaining strength, muscle mass, and height, and are completing the development of sexual traits (Blos, 1962). It has been suggested that puberty precipitates body dissatisfaction in girls because of increasing adipose tissue, which in turn moves them away from the current thin beauty ideal (Graber et al., 1994; Presnell et al., 2004). Adolescent girls tend to exhibit poorer self-esteem than boys (Bolognini et al., 1996; Diseth et al., 2014; Van Damme et al., 2014). Transitioning from early adolescence to mid-adolescence, the development of self-image is generally positive in healthy adolescents (Abramovitz et al., 1984). The strongest health benefit of physical activity for adolescents is improved psychological health (Sallis, 2000). Unhealthy behaviors such as smoking and substance use often generally begin during adolescence (Armstrong and Costello, 2002; Mangerud et al., 2014). The immediate positive effects of eating school lunch are observed in learning and concentration (Benton, 2003; Bellisle, 2004). Regular family meals during adolescence contribute to the formation of healthy eating habits later in life (Burgess-Champoux et al., 2009; Martin-Biggers et al., 2014). Peer relationships comprise important social resources for adolescents (La Greca and Prinstein, 1999). By the age of 16 years, the majority of adolescents report having had a romantic relationship (Carver et al., 2003). The incidence of psychiatric disorders increases from childhood through mid-adolescence and peaks in late adolescence and young adulthood (Newman et al., 1996). About one adolescent in five suffers from some psychiatric disorder (Costello et al., 2011).

The prevalence of adolescent overweight and obesity has been increasing in most parts of the world during the last 20–30 years (Lobstein and Frelut, 2003; Lissau

et al., 2004; Kautiainen, 2005). In 2013, among Finnish 8th and 9th graders, as many as 20% of the boys and 13% of the girls reported being overweight (http://www.info.thl.fi/kouluterveyskysely). The persistence of obesity from childhood to adolescence is high (Nader et al., 2006), and adolescent obesity tends to persist into adulthood (Serdula et al., 1993; Reilly et al., 2003; Singh et al., 2008). Child and adolescent overweight has mental health, social, and economic consequences (Gortmaker et al., 1993; Herva et al., 2006; Geoffroy et al., 2014).

In a meta-analysis based on studies including adult and adolescent participants, a reciprocal link between depression and obesity was confirmed. Obesity increased the risk of depression. In addition, depression was predictive of developing obesity (Luppino et al., 2010). The shared biology of depression and obesity are connected to the stress-related neuroendocrine system known as the hypothalamic–pituitary–adrenal (HPA) axis (Bornstein et al., 2006), leptin resistance (Lu, 2007; Lawson et al., 2012), and chronic inflammation (Haroon et al., 2012). The heritability of obesity and body weight is mostly high. There in increasing evidence of shared genetic factors, which may result in obesity and psychiatric disorders such as eating disorders, depression and phobic anxiety (Scherag et al., 2010; Afari et al., 2010; Walter et al., 2015).

In general, lower body satisfaction predicts the display of behaviors that may place adolescents at risk of weight gain (Neumark-Sztainer et al., 2006a). Studies based on clinical samples typically report poorer self-esteem in treatment seekers when compared with population-based samples (Wardle and Cooke, 2005). Overweight girls have been reported to have more problems with their sexual self-image and more psychopathology than their peers with normal weight (Pisk et al., 2012). Both increased physical activity and decreased sedentary behavior are protective against relative weight and fatness gains during adolescence (Must and Tybor, 2005). Overweight and obese adolescents are at higher risk of engaging in regular smoking (Lanza et al., 2014). Results concerning alcohol consumption and overweight in adolescents are controversial (Neumark-Sztainer et al, 1997; Croezen et al., 2009; Lanza et al, 2014). Breakfast skipping, which seems to be more prevalent among girls than boys (Croezen et al., 2009), is linked to an increased prevalence of adolescent overweight and obesity (Croezen et al., 2009; Huang et al., 2010). Frequent family meals have been associated with a lower BMI score (Berge et al., 2015). Overweight and obese adolescents have been described as socially marginalized (Strauss and Pollack, 2003). Obese girls have been reported to be less likely to date than their peers (Pearce et al., 2002). Research performed using structured clinical interviews has been scarce (Costello et al., 2005). The rates of current psychiatric disorders have been higher in referred groups, being as high as 58% (Vila et al., 2004) compared to approximately 20% in non-referred groups (Van Vlierberge et al., 2009) or even less (Mustillo et al., 2003).

The influence of obesity on psychological well-being is less clear than the physical impacts (Wardle and Cooke, 2005). An association between psychological well-being and overweight and obesity has been detected, but to examine the causality/directionality, further follow-up studies are needed (Zametkin et al., 2004; Yagnik et al., 2014). The results of psychiatric comorbidity in adolescents with overweight and obesity have been inconsistent, probably reflecting both methodological differences between studies and differences within study populations (Costello et al., 2005).

3. AIMS OF THE STUDY

This study aimed to investigate whether overweight and obesity are risk factors for psychological well-being among mid-adolescent students. The specific aims were:

1. To examine whether overweight and obese adolescents are more dissatisfied with their bodies than normal-weight adolescents, and the relationship of body dissatisfaction with self-esteem and eating habits in adolescence (Study I);
2. To study whether self-esteem, perceived health, weight satisfaction, eating habits, physical activity, friendships, intimate relationships, smoking and substance use are more prevalent among adolescents with overweight and obesity than among those with normal weight (Study II);
3. To investigate whether psychiatric comorbidity is more common and global functioning worse among adolescents with overweight and obesity than among those with normal weight (Study III);
4. To investigate whether the development of self-image and its components during a one-year follow-up period is better among adolescents with overweight and obesity than among those with normal weight (Study IV).

Data for girls and boys were separately analyzed.

4. SUBJECTS ANDS METHODS

4.1. STUDY DESIGN

The study "Psychological well-being in 14- to 15-year-old Finnish school girls and boys with overweight and obesity" was performed between the years 2003 and 2005. The study was population-based among Finnish adolescents. The design was cross-sectional in Studies I–III. Study IV was a one-year follow-up. A flow chart of the study project is presented in **Figure I** (see pages 38–39).

4.2. PARTICIPANTS

The study subjects were 2499 8th graders with a mean age of 14.5 years (SD 0.3) recruited from 24 out of 70 (34%) secondary schools in the city of Helsinki. The schools covered all the representative socio-economic groups across the city districts: the sample included state and municipal, as well as private schools. From the students, those attending ordinary education programs and speaking Finnish as their mother tongue were selected (n = 2286, 91.5%). For 916 (40.1%) students, either the student him/herself or his/her guardians did not give consent and they were omitted from the sample. Thus, the final sample comprised 1370 students (659 girls and 711 boys).

4.3. PROCEDURES (STUDIES I–IV)

The adolescents completed the questionnaires at their ordinary school lessons. Their teachers, familiarized with the study protocol by the researchers, explained the study procedure to the participants, as well as delivering and collecting the questionnaire and consent forms. The participants reported their subjective body weights and heights. In addition to this, school nurses measured the body weight and height of the participants (Study I sample: 650 girls, 693 boys; Study II sample: 614 girls, 651 boys). Diagnostic interviews were performed with a group of overweight and obese adolescents and their normal-weight controls (Study III subsample: 86 girls, 96 boys). A group of adolescents with overweight and obesity and their controls with normal weight participated in the one-year follow-up study. They completed a

self-assessment and the school nurses measured their weights and heights in both the initial phase and at the one-year follow-up (Study IV follow-up subsample; 78 girls, 88 boys). For details of the protocol, see Figure I, pages 38–39.

4.4. SAMPLES IN DIFFERENT STUDIES (I–IV)

In Study I, the original sample of adolescents in different weight groups (underweight, normal weight, overweight, and obese) was used (1343 adolescents, 650 girls and 693 boys). In Study II, those with overweight and obesity were selected from the original sample to form a subgroup with excess weight and underweight adolescents were excluded (1265 adolescents, 614 girls and 651 boys). Studies III (182 adolescents, 86 girls and 96 boys) and IV (166 adolescents, 78 girls and 88 boys) focused on adolescents with a relative weight of +26% or more. In these studies, a control subject from the original sample (relative weight of ±5% within the median weight for the respective gender cohort), matched by sex, age (±3 months), and school was selected for each subject with excess weight. If a subject refused to participate in the study, another subject fulfilling the same criteria from same school or from a socioeconomically similar school was asked to participate in the study (see flow chart, pages 38–39, and **Table I**).

4.4.1. THE ADOLESCENTS WHO DROPPED-OUT (STUDY IV)

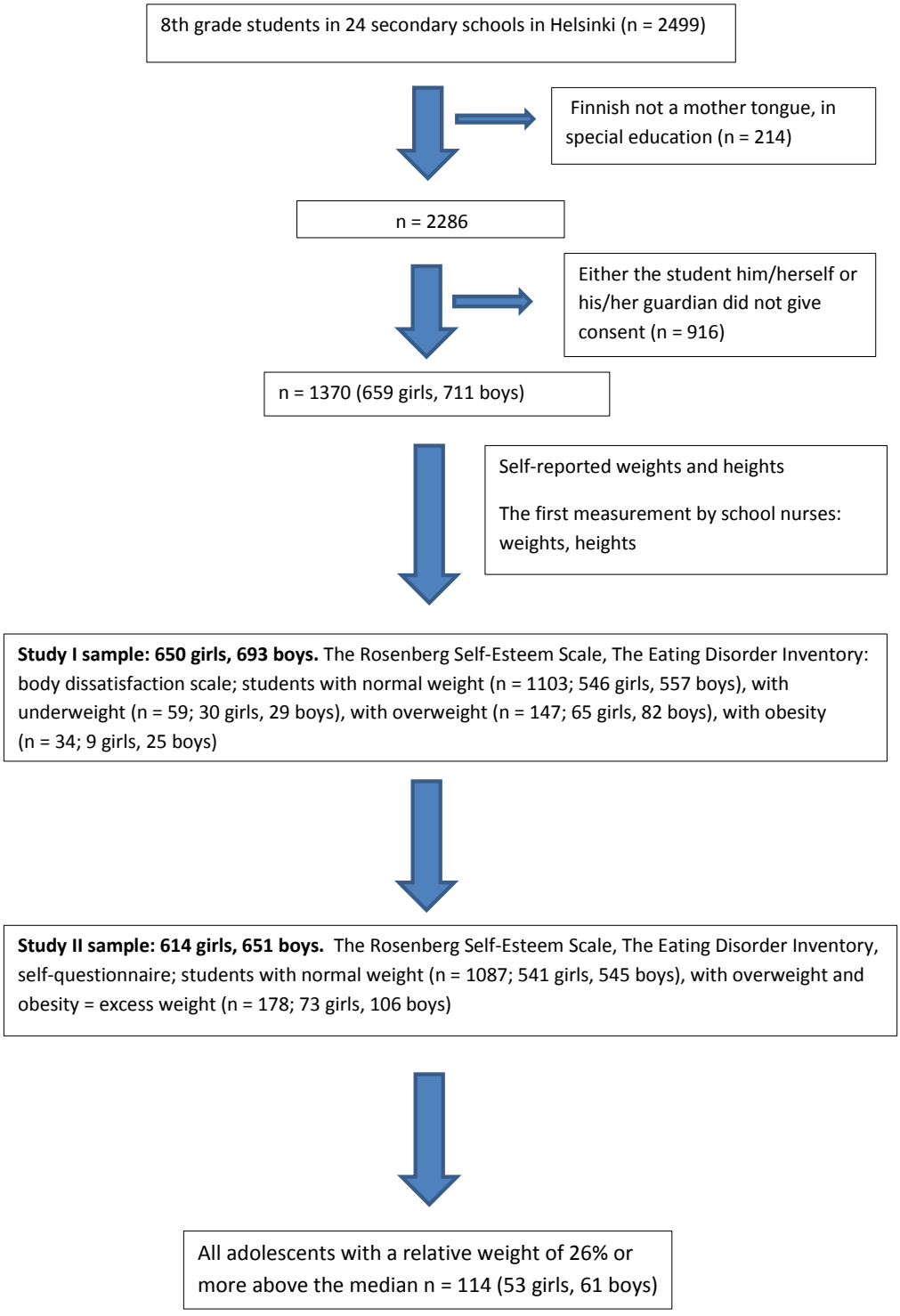
Among the adolescents with excess weight, the dropouts did not significantly differ from those who completed the follow-up, except that they had a higher initial relative weight [42.38 (SD 15.25) vs. 57.20 (SD 17.88); $p = 0.040$, $d = -0.96$]. Among the controls, the dropouts did not significantly differ from those participating in the whole study according to their relative weight or BMI. However, they showed significantly higher OSIQ-R total scores [2.45 (SD 0.55) vs. 3.06(SD 0.54); $p = 0.019$, $d = -1.10$], as well as component scores for social functioning [2.32 (SD 0.74) vs. 3.26 (SD 0.92); $p = 0.008$, $d = -1.23$], family functioning [2.34 (SD 0.77) vs. 3.22 (SD 0.73); $p = 0.014$, $d = -1.16$], self-confidence [2.46 (SD 0.61) vs. 3.08 (SD 0.54); $p = 0.029$, $d = -1.02$], sexuality [2.51 (SD 0.63) vs. 3.28 (SD 0.64); $p = 0.010$, $d = -1.22$], and ethical values [2.55 (SD 0.58) vs. 3.26 (SD 0.57); $p = 0.009$, $d = -1.22$].

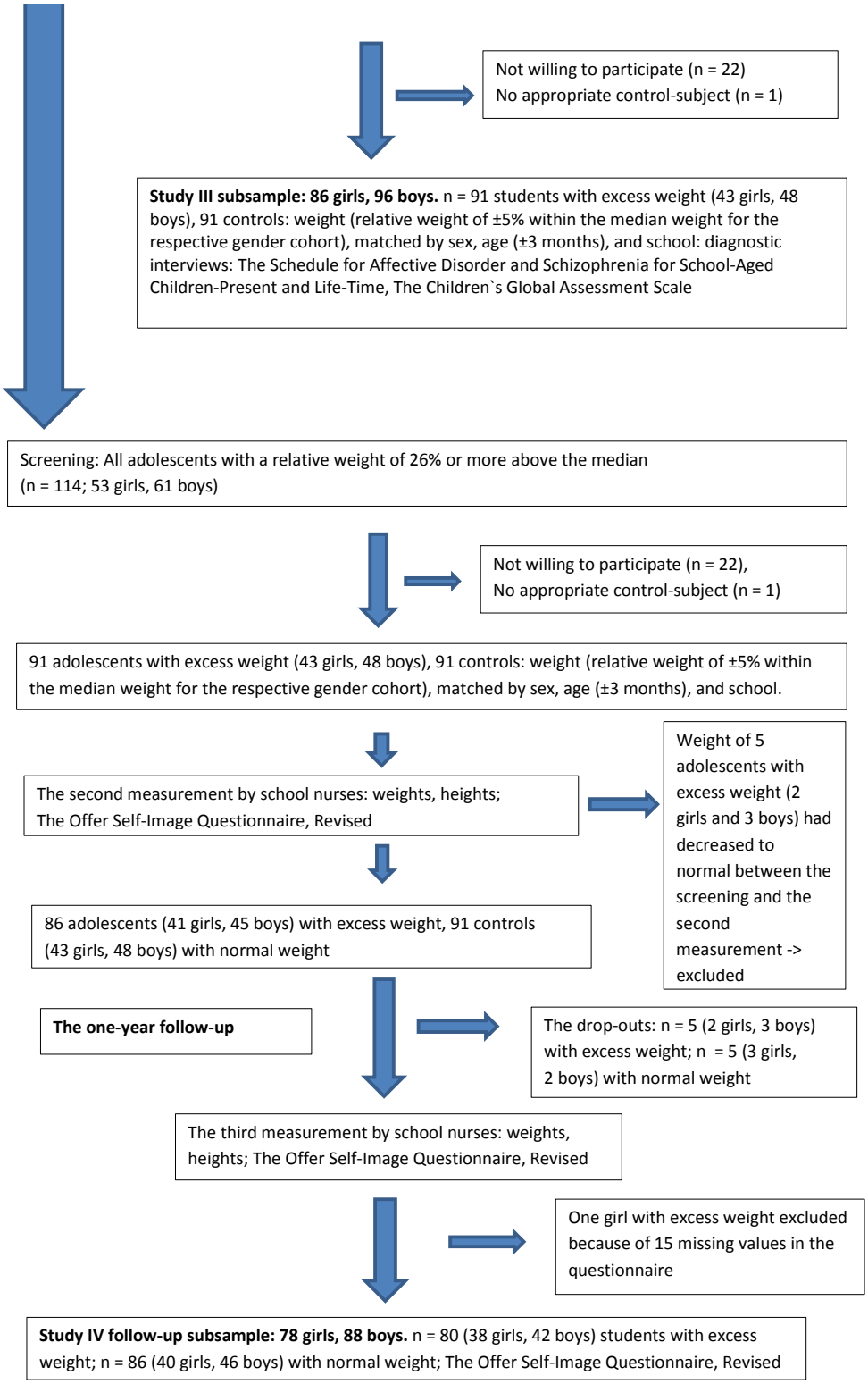
Table I Background factors in Studies I–IV. Means were compared using the independent-samples t-test, and the frequencies using the chi-squared test.

	All	Girls	Boys	p
Study I				
Sample N (%)	1343 (100%)	650 (48.40%)	693 (51.60%)	NS
Age mean (SD); range	14.47 (0.34); 13.20 – 16.00	14.44 (0.33); 13.20 – 15.90	14.49 (0.35); 13.30 – 16.00	0.016
Study II				
Sample N (%)	1265 (100%)	614 (48.54%)	651 (51.46%)	NS
Age mean (SD); range	14.47 (0.34); 13.20 – 16.00	14.44 (0.34); 13.20 – 15.90	14.49 (0.35); 13.30 – 16.00	0.018
Study III				
Subsample N (%)	182 (100%)	86 (47.25%)	96 (52.75%)	NS
Age mean (SD); range	14.77 (0.33); 14.10 – 15.60	14.78 (0.32) 14.20 – 15.60	14.77 (0.35) 14.10 – 15.50	NS
Study IV				
Follow-up subsample N (%)	166 (100%)	78 (46.99%)	88 (53.01%)	NS
Age at baseline mean (SD); range	14.73 (0.32); 14.10 – 15.50	14.70 (0.28); 14.20 – 15.40	14.76 (0.34) 14.10 – 15.50	NS
Age on follow-up mean (SD); range	15.74 (0.33); 15.10 – 16.60	15.70 (0.29); 15.20 – 16.40	15.78 (0.36) 15.10 – 16.60	NS

NS = non-significant ($p \geq 0.05$)

Figure 1. Flow-chart of the study project.




Not willing to participate (n = 22)
No appropriate control-subject (n = 1)
Study III subsample: 86 girls, 96 boys. n = 91 students with excess weight (43 girls, 48 boys), 91 controls: weight (relative weight of ±5% within the median weight for the respective gender cohort), matched by sex, age (±3 months), and school: diagnostic interviews: The Schedule for Affective Disorder and Schizophrenia for School-Aged Children-Present and Life-Time, The Children`s Global Assessment Scale
Screening: All adolescents with a relative weight of 26% or more above the median (n = 114; 53 girls, 61 boys)
Not willing to participate (n = 22),
No appropriate control-subject (n = 1)
91 adolescents with excess weight (43 girls, 48 boys), 91 controls: weight (relative weight of ±5% within the median weight for the respective gender cohort), matched by sex, age (±3 months), and school.
The second measurement by school nurses: weights, heights; The Offer Self-Image Questionnaire, Revised
Weight of 5 adolescents with excess weight (2 girls and 3 boys) had decreased to normal between the screening and the second measurement -> excluded
86 adolescents (41 girls, 45 boys) with excess weight, 91 controls (43 girls, 48 boys) with normal weight
The one-year follow-up
The drop-outs: n = 5 (2 girls, 3 boys) with excess weight; n = 5 (3 girls, 2 boys) with normal weight
The third measurement by school nurses: weights, heights; The Offer Self-Image Questionnaire, Revised
One girl with excess weight excluded because of 15 missing values in the questionnaire
Study IV follow-up subsample: 78 girls, 88 boys. n = 80 (38 girls, 42 boys) students with excess weight; n = 86 (40 girls, 46 boys) with normal weight; The Offer Self-Image Questionnaire, Revised

4.5. INSTRUMENTS

4.5.1. WEIGHT, HEIGHT, AND BMI MEASURES (STUDIES I–IV)

School nurses measured the body weight and height of the participants. There were altogether three measurement points: the baseline (I, II), the second one before the follow-up (III–IV), and the final one after the follow-up (IV). Self-reported body weights and heights were also collected (I–II) In Study I, estimated BMI values were used in cases where measured weight and/or height values were missing. For this thesis, the analyses of Study I were performed using the BMI based on self reported weight and height values instead of imputed BMI estimates (n = 54), because such BMI values strongly correlated with those reported by school nurses ($r = 0.91$, $p < 0.001$). Accordingly, in Study II, self-reported weights and heights were used in cases where measured weights and heights were missing (n = 50). When both measured and self-reported weights and heights were missing, in order to maintain an optimum amount of data, some missing BMI values were estimated, as the data for these participants were otherwise complete (I: 2.2‰; II: 3.2‰).

Relative weight and BMI were calculated, and the results were used to reflect the degree of excess body weight. Relative weight is commonly used in clinical praxis with children and adolescents in Finland. According to the Finnish Current Care Guidelines for obesity in children (Duodecim, 2012), relative weight or weight-for-height represents the percentage deviation of weight from the median value for any given height according to gender. Based on relative weight, the definitions for children and adolescents being underweight, overweight and obese are as follows:

Underweight	Relative weight 15.0% or more under the median weight;
Overweight	Relative weight 20–40% higher than the median as overweight;
Obese	Relative weight over 40% higher than the median weight.

In all studies (Studies I–IV), both relative weight and the respective BMI values are presented. In Studies I–II, analyses are based on the internationally used BMI cut-off points presented by Cole et al. (2000). The cut-off points are recommended for use in international comparisons of the prevalence of overweight and obesity among children and adolescents (Cole et al., 2000). In Studies III–IV, the screening of the excess weight group (overweight or obese participants) and their normal-weight control group was based on relative weight, for practical reasons. In addition, the <5th percentile of the reference curves for Finnish children was used as a cut-off point for being underweight according to the BMI (Wei et al., 2006).

4.5.2. THE ROSENBERG SELF-ESTEEM SCALE: RSES (STUDIES I–II)

Self-esteem was measured using the Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965). The self-assessment comprises 10 statements such as "I feel that I am a person of worth, at least on an equal plane with others" and "I feel that I have a number of good qualities" scored with four response options: strongly agree – agree – disagree – strongly disagree. A sum score can range from 0 to 30. A sum score below 21 indicates low self-esteem (Rosenberg, 1965). The RSES has been widely used in measuring self-esteem among adolescents and its reliability and validity are well documented (Fleming and Courtney, 1984). In the present study, the internal consistency was acceptable for both sexes (Cronbach's alpha 0.86 for girls and 0.79 for boys).

4.5.3. THE EATING DISORDER INVENTORY: EDI (STUDIES I–II)

The Eating Disorder Inventory (EDI) is a self-report questionnaire to measure subjective eating disorder pathology (Garner, 1991). It comprises 64 questions divided into eight subscales. Each question is answered on a 6-point scale (ranging from 'always' to 'never'), rated 0–3. The score for each sub-scale is then summed. One of the eight subscales, called Body dissatisfaction, was used in Study I. In the EDI, there is a recognized cut-off total score of 42, above which respondents are regarded as being susceptible to a clinical eating disorder (Bennett and Stevens, 1997). This total score was used in Study II. The EDI has been widely used to assess the presence of eating disorder problems among adolescents and its reliability and validity are well documented (Shore and Porter, 1990; Machado et al., 2001; Spillane et al., 2004). In this study, the internal consistency was acceptable for both sexes (Cronbach's alpha 0.82 for girls and 0.75 for boys).

4.5.4. QUESTIONNAIRE ON HEALTH- AND FOOD-RELATED ATTITUDES AND HABITS (STUDIES I–II)

Questions related to the participants' health- and food-related attitudes and habits were adapted from questions in the SHPS (http://www.info.thl.fi/kouluterveyskysely) and a large Finnish twin study by Keski-Rahkonen et al. (2005). The questions related to *eating habits* (It is easy for me to eat approximately the amount I need – I quite often eat more than I actually need – I often try to restrict my eating – Occasionally, I am on a strict diet or I overeat) (Studies I–II). In addition, in Study II, more detailed questions on health- and food-relateds attitudes and habits were used: *Attending school lunch* (I eat school lunch – I eat, but only bread, milk and/or salad – I eat no school lunch) , *attending*

evening meal (I eat an evening meal with my family – I eat an evening meal, but without my family – I eat no evening meal), *physical activity* (I perform physical activity at least once a day – I perform physical activity 2-6 times a week – I perform physical activity once a week or more rarely), *perceived health* (My health is excellent – My health is good – My health is average – My health is poor – My health is very poor), *weight satisfaction* (I have considerable excess weight – I have excess weight – I am of a desirable weight – I am underweight – I am considerably underweight), *close friends* (I have one close friend – I have two or more close friends – I have several close friends), *dating* (I have dated – I have not dated), *smoking* (I do not smoke – I smoke occasionally – I smoke regularly) and *alcohol use* (I do not use alcohol – I use alcohol once or twice a year – I use alcohol monthly – I use alcohol weekly).

4.5.5. DIAGNOSTIC INTERVIEWS: K-SADS-PL (STUDY III)

The psychiatric diagnoses according to DSM-IV (APA, 1994) were assigned using the Schedule for Affective Disorders and Schizophrenia for School-Aged Children – Present and Life-Time (K-SADS-PL), a semi-structured interview instrument with high reliability and validity (Kaufman et al., 1997), by the author himself, who is an experienced adolescent psychiatrist. 182 adolescents (86 girls and 96 boys) were interviewed.

4.5.6. ASSESSMENT OF PSYCHOSOCIAL FUNCTIONING: CGAS (STUDY III)

As part of the diagnostic interview, psychosocial functioning was assessed using the Children's Global Assessment Scale (CGAS) by Shaffer et al. (1983).

4.5.7. THE OFFER SELF-IMAGE QUESTIONNAIRE, REVISED: OSIQ-R (STUDY IV)

The Offer Self-Image Questionnaire, Revised (OSIQ-R) (Offer et al., 1992) was used to assess self-image at baseline and on one-year follow-up. The OSIQ-R is a 129-item test for adolescents measuring the feelings of teenagers about their own psychological world. Ratings are evaluated using a six-point Likert scale: describes me very well (1) – does not describe me at all (6). In OSIQ-R, self-image is conceptualized as a multidimensional construct, and it encompasses 12 component scales: emotional tone (the degree of affective harmony within the structure), impulse control (the extent to which an adolescent's ego is strong enough to handle various pressures without resorting to unacceptable tension-discharging actions),

mental health (emotional health in terms of relative absence of psychopathological thought processes), social functioning (patterns of interpersonal relationships and friendships), family functioning (an adolescent's feelings about, and relationships with his/her parents), vocational attitudes (the degree of confidentiality an adolescent feels in learning about and planning for a vocation), self-confidence (an adolescent's ability to adapt to his/her immediate environment), self-reliance (an adolescent's ability to cope with himself/herself, other people, and his or her own world), body image (the extent to which an adolescent has adjusted to his or her body), sexuality (an adolescent's feelings, attitudes, and behavior towards to the opposite sex), ethical values (the extent to which the conscience has developed), and idealism (an adolescent's ideals and his or her willingness to help others). The overall self-image is measured by the total self-image scale, which combines scores of component scales except those of sexuality and idealism, because their correlation with the other component scales is low. A low total raw score implies a positive self-image, while a high raw score implies a negative self-image. The OSIQ has been used and validated among Finnish adolescents (Erkolahti et al., 1992; Laukkanen et al., 1999a; Laukkanen et al., 1999b; Laukkanen et al., 2000; Lindfors et al., 2005). In this study, the internal consistency was acceptable for both sexes, except in the component scales ethical values, idealism, and self-reliance (**Table II**).

Table II Internal consistencies for OSIQ-R total and component scale scores. Cronbach's alpha coefficients are reported. Indices below the recommended value for at least acceptable reliability are in boldface.

	Girls (n = 78)		Boys (n = 88)	
	Baseline	Follow-up	Baseline	Follow-up
The Total Self-Image Scale	0.93	0.92	0.91	0.93
OSIQ-R Component Scales				
Emotional Tone	0.88	0.89	0.85	0.88
Impulse Control	0.76	0.74	0.70	0.79
Mental Health	0.84	0.80	0.74	0.80
Social Functioning	0.83	0.83	0.76	0.77
Family Functioning	0.92	0.90	0.89	0.89
Vocational Attitudes	**0.68**	0.70	**0.69**	0.75
Self-Confidence	0.78	0.78	0.70	0.83
Self-Reliance	**0.58**	**0.64**	**0.56**	0.72
Body image	0.81	0.81	0.83	0.85
Sexuality	0.79	0.74	0.76	0.70
Ethical values	**0.51**	**0.56**	**0.65**	0.72
Idealism	**0.58**	**0.61**	**0.58**	**0.61**

4.6. STATISTICAL METHODS (STUDIES I–IV)

Study I: Girls and boys were analyzed as separate groups. The expectation maximization method was used to impute single misssing values. Means were compared using an independent-samples t-test and one-way ANOVA, and the frequencies using the chi-squared (χ^2) test. To describe the practical significance, Cohen's d effect sizes were calculated from the t-tests (Cohen, 1998). An interaction term was used to estimate the differences in the correlations between gender and the explanatory variables. For regression analysis, eating habits were dichotomized (normal eating/abnormal eating). Linear regression analysis was used to measure the associations between body dissatisfaction and BMI, self-esteem and eating habits, despite the fact that some relationships differed from a linear relationship and some distributions were skewed. The results of the distribution-free method CATREG and linear regression analysis were very similar (van der Kooij, 2007). Eliminating the lowest and highest 5% of scores did not influence the results of the linear regression analysis. The nonlinearity between variables was compared and described by BMI squared and LOWESS (locally weighted scatterplot smoothing) regression (Cleveland and Devlin, 1988).

Study II: The expectation maximization method was used to impute single misssing values. To compare the groups, an overall chi-squared test was applied. Partitioning chi-squared was only reported with overall significance. Fisher's exact test was performed when the expected values were too small for a chi-squared test. The t-test for independent groups was used to calculate the differences in the continuous RSES and EDI scales. For the chi-squared test and Fisher's exact test, the phi coefficient in 2 x 2 tables and Cramer's V in larger tables were used as effect size measures, and for the independent samples t-test, eta squared was calculated. To examine the extent to which dichotomized covariates had a partial explanatory effect with BMI (when other regressors were held constant), and to reveal possible confounding effects, multiple binary logistic regression analysis was used. Linear probability model analysis was performed to examine the role of gender as a moderator (Baron and Kenny, 1986).

Study III: To compare the groups, the chi-squared test, Fisher's exact test and the independent-samples t-test were performed. As the effect size measure, the phi coefficient was calculated for the chi-squared test and Fisher's exact test, and eta squared for the independent-samples t-test.

Study IV: The expectation maximization method was used to impute single missing values in the OSIQ-R. The scores were calculated by dividing the sum by the number of items in the scale, as this improves the comparability of scales. Linear Mixed

Model (LMM) analysis was used for statistical analysis (Norušis, 2005). Various *post hoc* tests were performed using capabilities in the LMM (the TEST procedure). All the *post hoc* tests were carried out with no correction, i.e. with LSD as the default. There was no statistical power in the change comparisons between subgroups in component scales. The statistical sensitivity also varied between the comparisons, depending upon the correlation between measurements in the initial phase and at the one-year follow-up. Instead, graphical presentations based on effect sizes are reported. By dividing the observed difference by the pooled standard deviation, Cohen's d (d) indices were calculated. When the absolute value was greater than d = 0.2, the results are reported. In dropout analysis, the independent samples t-test was performed.

P-values < 0.05 indicated statistical significance in all tests. For Cohen's d, an effect size of 0.2 to 0.3 was interpreted as a small effect, around 0.5 as a medium effect, and 0.8 or above as a large effect (Cohen, 1998). Respectively, the magnitudes of the phi coefficient and Cramer's V coefficient were interpreted the following way: 0.00 to under 0.10, negligible association; 0.10 to under 0.20, weak association; 0.20 to under 0.40, moderate association; 0.40 to under 0.60, relatively strong association; 0.60 to under 0.80, strong association; and 0.80 to 1.00, very strong association (Rea and Parker, 1992). For eta squared, an effect size of 0.00 to 0.05 was interpreted as a small effect; 0.06 to 0.13 as a moderate effect, and 0.14 to 1.00 as a large effect (Cohen, 1998). In line with previous research, reliability coefficients (Cronbach's alpha) < 0.60 were interpreted as insufficient, 0.60 to 0.69 marginal, 0.70 to 0.79 acceptable, 0.80 to 0.89 good, and 0.90 excellent (Barker et al., 1994). The data were analyzed using SPSS for Windows, version 18.0 (Study I), version 20.0 (Studies II–III), and version 22.0 (Study IV) (Pallant, 2010).

4.7. ETHICAL CONSIDERATIONS (STUDIES I–IV)

The Ethics Committee of the Hospital for Children and Adolescents at Helsinki University Central Hospital approved the study. Letters describing the nature of the study were sent to the parents or guardians of the participants. The participants were requested to provide their own written consent at the study session. Treatment referral was recommended when appropriate. Treatment referral because of obesity was made according the guidelines used in the Hospital for Children and Adolescents at Helsinki University Hospital (2 participants). Treatment referral because of other reasons was requested to be considered by school nurses when appropriate (1 participant).

4.8. PERSONAL INVOLVEMENT (STUDIES I–IV)

The author participated in the design of the study. He had the main responsibility for obtaining the consent for the study. He collected the data, including the diagnostic interviews, and analyzed the data together with a statistician. He served as the first and corresponding author of all four publications of the study.

5. RESULTS

5.1. BODY DISSATISFACTION AND BODY MASS IN GIRLS AND BOYS TRANSITIONING FROM EARLY TO MID-ADOLESCENCE: ADDITIONAL ROLE OF SELF-ESTEEM AND EATING HABITS
(STUDY I SAMPLE: 650 GIRLS, 693 BOYS)

The BMI cut-off points and weight status among girls and boys participating in the study are presented in **Table III.**

Table III BMI cut-off points and weight status among 1343 8th graders

	BMI cut-off points		Frequencies	
Weight status	**Girls**	**Boys**	**Girls n (%)**	**Boys n (%)**
Underweight	< 16.40*	< 16.00*	30 (4.6)	29 (4.2)
Normal weight	≥ 16.40	≥ 16.00	546 (84.6)	557 (80.4)
Overweight	≥ 23.66**	≥ 22.96**	65 (9.7)	82(11.3)
Obese	≥ 28.87**	≥ 27.98**	9 (1.4)	25 (3.6)
Total			650 (100.0)	693 (100.0)

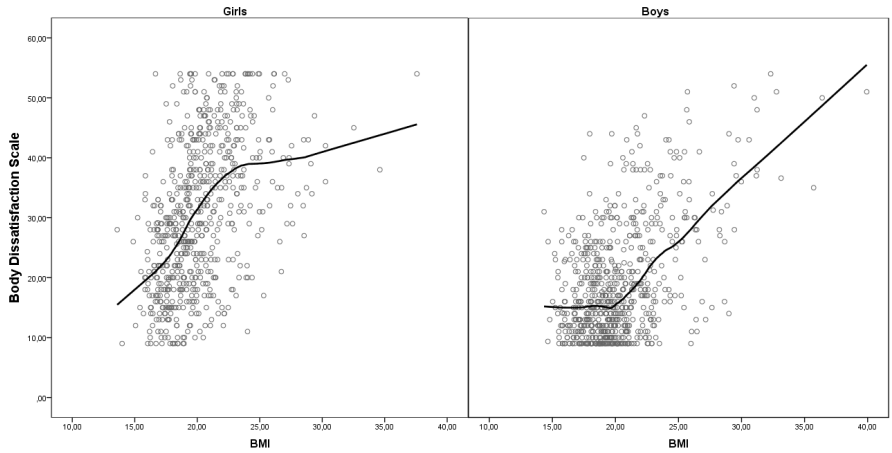
*The cut-off points of BMI for being underweight at the age of 14.5 years are based on growth data for Finnish children (Wei et al., 2006)

**The international cut-off points of BMI for being overweight and being obese at the age of 14.5 years in adolescent girls and boys (Cole et al., 2000)

5.1.1. RELATIONSHIP BETWEEN BODY DISSATISFACTION AND BODY MASS

The correlation between self-reported BMI estimates and imputed BMI was significant ($r = 0.63$, $p < 0.001$). The results were nearly identical when using the self-reported BMI estimates (**Figure II**) instead of the imputed BMI estimates when the measured heights and weights were lacking (see **Figure 1**, in Study I).

Figure II Associations of the Body Dissatisfaction Scale with BMI in 650 girls and 693 boys described by a Lowess curve.



The experience of body dissatisfaction was more prevalent among the girls than the boys (**Table IV**).

Table IV Gender-specific differences in body dissatisfaction, self-esteem and body mass index among 650 girls and 693 boys.

	Girls	Boys		
	Mean (SD)	Mean (SD)	p	Effect size (d)
BD of EDI	30.58 (12.18)	18.95 (9.46)	< 0.001	1.1*
BMI	20.23 (2.99)	20.27 (3.29)	NS	0.0
RSES	27.98 (5.94)	31.26 (4.75)	< 0.001	0.6**

BD of EDI = The Body Dissatisfaction subscale of the Eating Disorder Inventory, BMI = The body mass index, RSES = The Rosenberg Self-Esteem Scale, d = Cohen's d (*= large, ** = medium), NS = non-significant (p ≥ 0.05)

The girls were most satisfied with their bodies when they were underweight, more dissatisfied when they were of normal weight and most dissatisfied when they had excess weight (body dissatisfaction: mean score (SD) = 19.98 (7.88) vs. 29.99 (11.90) vs. 39.18 (10.64); $p < 0.001$). The same was also observed in boys (body dissatisfaction: mean score (SD) = 16.28 (6.41) vs. 17.17 (7.83) vs. 28.96 (SD 11.52); $p < 0.001$) (**Figure II**).

An association between body dissatisfaction and BMI was detected in both genders (**Table V**). There were, however, differences between genders. Among normal-weight girls, an association between body dissatisfaction and BMI was observed ($r = 0.44$, $p < 0.001$), but not among underweight ($r = -0.11$, $p = 0.57$, NS) or excess-weight girls ($r = 0.08$, $p = 0.52$, NS). In boys, an association between body

dissatisfaction and BMI was found among those with normal weight ($r = 0.23$, $p < 0.001$), as well as those with excess weight ($r = 0.50$, $p < 0.001$). However, no such relationship between body dissatisfaction and BMI was recorded in underweight boys ($r = -0.35$, $p = 0.065$, NS) (**Figure II**).

Table V Linear regression analysis, coefficients, with the Body Dissatisfaction subscale of the Eating Disorder Inventory as the dependent variable among 650 girls and 693 boys.

		UC		SC			Correlations (zero-order)	UPV
		B	Std. Error	Beta	t	p	Pearson	%
Girls	BMI	1.76	0.14	0.43	12.46	< 0.001	0.46	12.1
	BMI squared	−0.86	0.21	−0.14	−4.18	< 0.001	0.12	1.4
	RSES	−0.80	0.06	−0.39	−13.06	< 0.001	−0.52	13.2
	EH	6.07	0.78	0.24	7.78	< 0.001	0.48	4.7
Boys	BMI	1.03	0.11	0.36	9.27	< 0.001	0.52	7.1
	BMI squared	0.51	0.13	0.15	3.95	< 0.001	0.42	1.3
	RSES	−0.68	0.06	−0.34	−11.49	< 0.001	−0.39	11.0
	EH	3.49	0.70	0.14	4.70	< 0.001	0.35	1.8

UC = unstandardized coefficients, SC = standardized coefficients, BMI = The body mass index, RSES = The Rosenberg Self-Esteem Scale, EH = eating habits, UPV = Unique proportion of the variance. Girls: Squared multiple correlation x 100 = 49.8%, Boys: 42.8%

5.1.2. RELATIONSHIP BETWEEN BODY DISSATISFACTION AND SELF-ESTEEM

Boys exhibited higher self-esteem scores than girls (**Table IV**). A linear association between body dissatisfaction and self-esteem was observed among both genders, although the correlation was significantly stronger among girls (see **Figure 2,** in Study I**; Table V**).

5.1.3. RELATIONSHIP BETWEEN BODY DISSATISFACTION AND EATING BEHAVIOR

Eating habits differed significantly between the genders (see **Table 4**, in Study I). Normal eating was more prevalent among boys than girls ($p < 0.001$). Respectively, among girls, subjectively expressed overeating ($p = 0.026$), restrictive eating ($p < 0.001$) and alternating restrictive eating/overeating ($p = 0.001$) were more prevalent than among boys (see **Table 4,** in Study I). Eating habits and body dissatisfaction had a stronger relationship among girls than boys ($p < 0.001$) (**Table IV**). Self-reported abnormal eating was associated with higher BMI values (mean 21.64 kg/m^2 (SD 3.70) vs. 19.69 kg/m^2 (SD 2.67), $p < 0.001$) and higher body dissatisfaction

scores (mean 33.09 (SD12.92) vs. 21.16 (SD10.24), $p < 0.001$) compared to reported normal eating.

Regression analysis performed with BMI, BMI squared, self-esteem, and eating habits together explained 49.8% of the total variation in body dissatisfaction in girls and 42.8% in boys (**Table V**). When regression analysis was performed using the LOWESS variable instead of BMI squared, significantly more variation was explained: 50.1% in girls and 44.0% in boys ($p < 0.001$). Consequently, the non-linearity between body dissatisfaction and BMI was better described by the LOWESS variable than the quadratic component. However, in regression analysis, the quadratic component was also significant ($p < 0.001$). Graphically, the relationship comprised two separate linear components around a turning point in girls and boys. A quadratic relationship was not clearly seen (**Figure II**).

5.2. PSYCHOLOGICAL WELL-BEING IN ADOLESCENTS WITH OVERWEIGHT AND OBESITY

(STUDY II SAMPLE: 614 GIRLS, 651 BOYS)

5.2.1. SELF-ESTEEM

The mean RSES total scores are presented in **Table VI**. They did not differ significantly between adolescents with overweight and obesity and those with normal weight. Furthermore, no statistically significant difference was observed when the total scores according to gender were compared. The proportion of adolescents scoring below 21 points in RSES did not significantly differ between the two weight groups (19/178 (10.7%) vs. 88/1087 (8.1%); $\chi^2 = 1.31$, p = NS). This same finding was observed both girls (14/73 (19.2%) vs. 75/541 (13.9%), $\chi^2 = 1.47$, p = NS) and boys (5/105 (4.8%) vs. 13/546 (2.4%); $\chi^2 = 1.86$, p = NS).

5.2.2. SUBJECTIVE EATING DISORDER PATHOLOGY

The mean EDI total score in adolescents with overweight and obesity was significantly higher than in their normal-weight peers. The result was the same when the total scores according to gender were compared (**Table VI**). The proportion of adolescents susceptible to a clinical eating disorder

(EDI total score > 42) was significantly higher among adolescents with overweight and obesity than among those with normal weight (51/178 (28.7%) vs. 128/1087 (12.7%); $\chi^2 = 30.64$, $p < 0.001$, Phi = 0.16). This difference between the weight groups was also observed in girls (32/73 (43.8%) vs. 108/541 (20.0%); $\chi^2 = 20.83$, $p < 0.001$, Phi = 0.18) and boys (19/105 (18.1%) vs. 30/546 (5.5%); $\chi^2 = 20.09$, $p < 0.001$, Phi = 0.18).

Table VI Self-esteem and eating disorder pathology among 8th graders with overweight and obesity

	Adolescents with overweight/ obesity	Adolescents with normal weight	Statistics (t-value)	p	Eta squared
	All (179)	**All (1086)**			
RSES total score, mean (SD)	29.06 (6.02)	29.70 (5.55)	1.42	NS	
EDI total score	30.84 (20.95)	22.87 (18.24)	-5.29	< 0.001	0.02
	Girls (73)	**Girls (541)**			
RSES total score, mean (SD)	26.93 (6.73)	28.0 (5.81)	1.45	NS	
EDI total score	38.96 (23.99)	27.93 (21.69)	-4.03	< 0.001	0.03
	Boys (106)	**Boys (545)**			
RSES total score, mean (SD)	30.52 (5.00)	31.38 (4.72)	1.71	NS	
EDI total score	24.25 (16.50)	17.86 (12.09)	-4.39	< 0.001	0.03

RSES = the Rosenberg Self-Esteem Scale, EDI = the Eating Disorder Inventory, NS = non-significant ($p \geq 0.05$)

5.2.3. HEALTH- AND FOOD-RELATED HABITS

Eating habits. There were significant differences in eating habits between adolescents with overweight and obesity and those with normal weight (see **Tables 1** and **2**, in Study II). Adolescents with overweight and obesity showed significantly higher prevalence rates of overeating, restrictive eating, and alternating restrictive/ over eating. Among girls, restrictive eating and alternating restrictive/overeating were significantly more prevalent among those with overweight and obesity than among those with normal weight. In boys, overeating and restrictive eating were significantly more prevalent among those with weight problems than among those with normal weight.

Attending school lunch and evening meal. In the further analysis, the options "I eat school lunch" and "I eat school lunch, but only bread, milk and/or salad" were categorized as attending school lunch. Neither girls nor boys with overweight and obesity significantly differed from their normal-weight peers in attending school lunch. The options "I eat an evening meal with my family" and "I eat an evening meal without my family" were categorized as attending evening meal. Again, no statistically significant differences were observed in attending evening meal between weight groups for either gender.

Perceived health. In the analysis, the options "My health is excellent" and "My health is good" were interpreted as indicating the subjective feeling that the respondent was well. The options "My health is poor" and "my health is very poor"

were categorized as a subjective feeling of poor health. The proportion of boys with an average or poor perceived health was higher among those with overweight and obesity than among those with normal weight. In girls, the proportion of persons with average health was higher among those with weight problems than among those with normal weight.

Physical activity. Among boys, the proportion of those who performed physical activities only once a week or even more rarely were higher among those with overweight and obesity than among those with normal weight. This difference was not observed among the girls. However, among girls, the prevalence of those who exercised only once a week or more rarely was as high as 15.1% in those with overweight and obesity and 16.5% in those with normal weight.

Weight satisfaction. In the analysis, the options "I have considerable excess weight" and "I have excess weight" were categorized as a feeling of having excess weight. The options "I am underweight" and "I am considerably underweight" together reflected a feeling of being underweight. Most of the girls (79.5%) and boys (66.7%) with objective overweight or obesity felt themselves as having excess weight, but 20.5% of girls and 32.4% of boys with objective weight problems felt that they were of a desirable weight. Among objectively normal-weight girls and boys, as many as 27.7% of girls and 8.2% of boys felt that they had excess weight.

Close friends. In the further analysis, the options "I have one close friend", "I have two or more close friends", and "I have several friends" were categorized as having one or more close friends. The proportion of individuals with one or more close friends did not differ between adolescents with overweight and obesity and their normal-weight peers for either gender.

Dating. Among both boys and girls, the proportion of individuals with dating experiences was lower among those with overweight and obesity than their normal-weight peers.

Smoking and alcohol use. In the analysis, the options "I smoke occasionally" and "I smoke regularly" were interpreted as smoking. Both in girls and boys, the number of persons who smoked did not differ between the weight groups. The options "I use alcohol once or twice a year", "I use alcohol monthly" and "I use alcohol weekly" were categorized as using alcohol. The proportion of persons who did not use alcohol at all did not differ between those with overweight and obesity and those with normal weight for either gender.

5.3. PSYCHIATRIC MORBIDITY AND GLOBAL FUNCTIONING IN ADOLESCENTS WITH OVERWEIGHT AND OBESITY

(STUDY III SUBSAMPLE: 86 GIRLS, 96 BOYS)

The prevalence of psychiatric disorders did not differ between the adolescents with overweight and obesity and those with normal weight. This was the case among both girls and boys (see **Tables 1–3**, in Study III). In girls, both in those with overweight and obesity and those with normal weight, the most common lifetime (girls with overweight/obesity: 11.2%; girls with normal weight: 7.0%) and current (girls with overweight/obesity: 11.7%; girls with normal weight: 9.3%) psychiatric disorder was depression. In boys, both the lifetime (boys with overweight/obesity: 2.1%; boys with normal weight: 0.0%) and current (boys with overweight/obesity: 2.1%; boys with normal weight: 0.0%) prevalence rates of depression were much lower.

In girls, the mean C-GAS did not differ between the weight groups, but in boys it was significantly lower in those with overweight and obesity (see **Tables 1–3**, in Study III). In overweight and obese girls and boys, as well as in girls with normal weight, the mean C-GAS score reflected slight impairments in functioning at home, at school, or with peers. The normal-weight boys, on the other hand, showed good functioning in all these areas.

5.4. DEVELOPMENT OF SELF-IMAGE AND ITS COMPONENTS DURING A ONE-YEAR FOLLOW-UP

(STUDY IV FOLLOW-UP SUBSAMPLE: 78 GIRLS, 88 BOYS)

5.4.1. CHANGE IN SELF-IMAGE IN THE FOUR SUBGROUPS DURING A ONE-YEAR FOLLOW-UP

Changes in the OSIQ-R total mean scores during the one-year follow-up in the four subgroups are graphically presented in **Figure 1,** in Study IV. The level differences ((baseline + follow-up)/2) between the groups (overall test $p < 0.001$), and the mean change for all participants ($n = 166$, $p < 0.001$) were significant, showing that the development of self-image was positive in all four subgroups during the follow-up. Time*group interaction was significant ($p = 0.012$). The change among normal-weight girls was greater than that in other groups (custom contrast, $p = 0.001$), showing the positive development especially among these girls. The other three change scores were very similar. Normal-weight girls showed a significantly larger change than excess-weight girls ($p = 0.024$). The corresponding difference between boys with normal and excess weight was not statistically significant. Between girls and boys with normal weight, a statistically significant difference ($p = 0.048$) was observed in the OSIQ-R total change scores, also showing the positive development in self-image especially among girls with normal weight. Between excess-weight girls and boys, the corresponding difference was not significant.

5.4.2. CHANGE IN SELF-IMAGE AND ITS COMPONENTS DURING A ONE-YEAR FOLLOW-UP

The OSIQ-R change scores compared to zero are presented in **Table VII**.

Among girls with excess weight, the development of self-image in component scales was mostly positive. When change scores were compared to zero, the largest positive development was in impulse control, body image, and sexuality (**Table VII**, see **Figure 2,** in Study IV). However, the development was not statistically significant in any component scale. Among girls with normal weight, all change scores were negative, indicating a positive development in self-image. A significant positive development of self-image according to change scores compared to zero was recorded in impulse control, social functioning, vocational attitudes, self-confidence, self-reliance, body image, sexuality, and ethical values (**Table VII,** see **Figure 2**, in Study IV). In boys, the development of self-image was positive among those with excess weight and normal weight. Change scores were negative, with exception of idealism (**Table VII,** see **Figure 2**, in Study IV). Among boys with excess weight, significant change scores were recorded in sexuality and idealism. Among boys with normal weight, significant change scores indicating a positive development of self-image were recorded in impulse control, mental health, self-reliance, and sexuality (**Table VII,** see **Figure 2**, in Study IV).

Table VII The change scores compared to zero in twelve OSIQ-R component scales.

	Girls with excess weight (n = 38)		Girls with normal weight (n = 40)		Boys with excess weight (n = 42)		Boys with normal weight (n = 46)	
	p	d	p	d	p	d	p	d
Emotional Tone	NS	-0.03	NS	-0.23	NS	-0.02	NS	-0.15
Impulse Control	NS	-0.25	0.009	-0.44	NS	-0.02	0.042	-0.31
Mental Health	NS	-0.11	NS	-0.29	NS	-0.19	0.048	-0.30
Social Functioning	NS	-0.11	0.050	-0.32	NS	-0.11	NS	-0.09
Family Functioning	NS	-0.13	NS	-0.16	NS	-0.04	NS	-0.03
Vocational Attitudes	NS	-0.11	0.013	-0.41	NS	-0.06	NS	-0.03
Self-Confidence	NS	-0.17	0.020	-0.38	NS	-0.17	NS	-0.26
Self-Reliance	NS	-0.10	0.007	-0.45	NS	-0.04	0.024	-0.34
Body image	NS	-0.25	0.001	-0.56	NS	-0.13	NS	-0.07
Sexuality	NS	-0.22	< 0.001	-0.90	0.009	-0.42	0.036	-0.32
Ethical values	NS	-0.15	0.009	-0.43	NS	-0.16	NS	-0.06
Idealism	NS	0.11	NS	-0.12	0.005	-0.46	NS	0.08

d = Cohen's d, NS = non-significant ($p \geq 0.05$)

5.4.3. COMPARISONS OF THE CHANGE IN SELF-IMAGE BETWEEN EXCESS-WEIGHT AND NORMAL-WEIGHT ADOLESCENTS

When the girls with normal and excess weight were compared, the difference in change scores was largest in sexuality ($p = 0.018$, $d = -0.52$) and vocational attitudes ($p = 0.041$, $d = -0.52$), showing better self-image development among normal-weight girls than excess-weight girls, especially in these two component scales during the follow-up. Focusing on effect sizes, there were notable differences in the following components: social functioning ($d = -0.24$), self-reliance ($d = -0.23$), ethical values ($d = -0.26$), and idealism ($d = -0.23$), showing a trend to higher change scores among normal-weight girls than those with excess weight. In boys, no statistically significant differences emerged in component change scores, indicating no significant differences in self-image development between excess-weight and normal-weight boys. However, focusing on effect sizes, differences were detected in impulse control ($d = -0.27$), self-reliance ($d = -0.28$), and idealism ($d= -0.28$), indicating a trend to higher change scores among boys with normal weight than those with excess weight (see **Figure 2**, in Study IV).

5.4.4. COMPARISONS OF CHANGE IN SELF-IMAGE BETWEEN GENDERS

When the boys and girls with excess weight were compared, no statistically significant differences were observed in the component scores, but using Cohen's d indices, some notable differences emerged in impulse control ($d = 0.24$) and idealism ($d = 0.28$) (see **Figure 2,** in Study IV), showing that excess-weight girls had a trend to higher change scores than boys with excess-weight. When the boys and girls with normal weight were compared, a statistically significant difference was observed in sexuality ($p = 0.035$, $d = 0.46$) and body image ($p = 0.034$, $d = 0.52$). Using Cohen's d indices, there were also notable differences in social functioning ($d = 0.21$), vocational attitudes ($d = 0.33$), and ethical values ($d = 0.28$), indicating better self-image development among normal-weight girls than normal-weight boys.

6. DISCUSSION

6.1. THE RELATIONSHIP BETWEEN BODY DISSATISFACTION AND BODY MASS IN MID-ADOLESCENCE
(STUDY I SAMPLE: 650 GIRLS, 693 BOYS)

The finding that girls were more dissatisfied with their bodies than boys were is in line with previous studies (Rosenblum and Lewis, 1999; Presnell et al., 2004; Jones, 2004). Underweight girls were most satisfied with their bodies, and normal-weight or overweight girls were less satisfied. This finding is consistent with earlier studies reporting the impact of a greater body mass on body dissatisfaction in adolescent females (Stice and Whitenton, 2002; Jones 2004; Paxton et al., 2006). A recent study indicated that body satisfaction was protective against increased body mass, which highlights the importance of helping adolescent females, regardless of their size, to develop a positive sense of their bodies (van den Berg and Neumark-Sztainer, 2007). Some earlier studies among adolescent boys have described the relationship between body dissatisfaction and body mass as quadratic, indicating that boys express most dissatisfaction with their bodies when they are either below or above normal weight and most satisfaction when they are of normal weight (Presnell et al., 2004; Austin et al., 2009). A significant quadratic component was also found in the present study, but the non-linearity was better described by LOWESS regression. The curve had an inverse L-shape, indicating that body dissatisfaction was related to being overweight or obese, but not underweight. Age does not explain this finding, since a quadratic component has been described in both younger and older males than those in this sample (Presnell et al., 2004; Austin et al., 2009). Cultural norms may, however, be a reason for the difference, which should be studied in the future.

6.2. PSYCHOLOGICAL CORRELATES OF OVERWEIGHT AND OBESITY IN MID-ADOLESCENCE (STUDIES I–II, IV)

6.2.1. SELF-ESTEEM (STUDY I SAMPLE: 650 GIRLS, 693 BOYS; STUDY II SAMPLE: 614 GIRLS, 651 BOYS)

The study revealed that most 8th graders showed good self-esteem, and no significant differences were observed between overweight and obese adolescents and those with normal weight. This finding is in line with many previous studies performed in general populations (Wardle and Cooke, 2005). There are reports of age-related

differences in the relationship between self-esteem and overweight/obesity, the relationship being stronger in older than in younger adolescents (French et al., 1995). According to the present study, in the mid-adolescent general population, weight status does not appear to linked to self-esteem or problems with it. Self-esteem and body dissatisfaction were negatively correlated in girls and boys, and the correlation was stronger among the girls. In clinical work, the findings support the importance of strengthening the self-esteem of adolescents with abnormal eating, which consequently may reduce their body dissatisfaction and lower the risk of developing eating disorders (O'Dea, 2004).

6.2.2. **SELF-IMAGE** (STUDY IV FOLLOW-UP SUBSAMPLE: 78 GIRLS, 88 BOYS)

As described by Abramowitz et al. (1984), mid-adolescence is a developmental period characterized by intense maturation. In this study, during one-year follow-up, significantly better adjustment was observed among normal-weight girls in the most component scales. Among girls with excess weight, a trend towards better adjustment was seen, but the development was not statistically significant. When girls in different weight groups were compared, the difference in the development was largest in sexuality and vocational attitudes. This finding is comparable to that reported in overweight girls in late adolescence (Pisk et al., 2012), as well as in girls with severe underweight (Steinhausen and Vollrath 1993; Erkolahti et al., 2002). This finding is also in accordance with previous studies reporting that obese adolescents exhibit problems in forming intimate relationships (Pearce et al., 2002). Modern Western culture emphasizes thinness, and girls compare themselves with their peers, which may lead to severe frustration when a girl sees herself as significantly different from the others (Schwartz and Brownell, 2004). Adolescent girls with overweight may experience feelings of inadequacy (Pisk et al., 2012). In education and employment, individuals with overweight problems often face discrimination (Puhl and Brownell, 2001). This may all reflect in vocational attitudes among excess-weight females.

Between excess- and normal-weight boys no statistically significant differences emerged in self-image development according to change scores. Thus, it appears that among mid-adolescent boys, the development of self-image is not substantially influenced by overweight and obesity.

Both an early age of onset of obesity and being female are risk factors for body image distortions (Schwartz and Brownell, 2004). However, Pisk et al. (2012) did found no statistically significant difference in body image between late adolescent normal and overweight girls in a cross-sectional study using the OSIQ-R. In this study, body image was one of the self-image components with significant change scores towards better adjustment among normal-weight girls. Among excess-weight

girls, body image also showed a positive development, but this development was not statistically significant. Thus, although development towards better adjustment in body image was observed in both weight groups among girls, this development was more intense among those with normal weight.

6.2.3. **PHYSICAL ACTIVITY** (STUDY II SAMPLE: 614 GIRLS, 651 BOYS)

In general, adolescent girls generally exhibit less physical activity than boys (Vilhjalmsson and Kristjansdottir, 2003). In the present sample, the proportion of girls with minimal physical activity was equally high in both weight groups. Among the boys, physical inactivity was more prevalent among those with overweight and obesity. The finding that approximately 14% of the 8th graders reported minimal exercise supports the need to develop a national strategy for physical activities for secondary schools students in order to prevent weight problems, but also to promote somatic and psychological health in general. According to a recent Cochrane review (Dobbins et al., 2013), there is evidence that school-based physical activity programs can promote physical activity and fitness. A longitudinal randomized trial performed in France demonstrated that enhancing physical activity with a multilevel school-based program can even prevent excessive weight gain (Simon et al., 2008). The strength of evidence is moderate that a combined diet and physical activity intervention conducted in the community with a school component is more effective at preventing obesity or overweight (Katzmarzyk et al., 2014).

6.2.4. **SMOKING AND ALCOHOL USE** (STUDY II SAMPLE: 614 GIRLS, 651 BOYS)

Over 80% of the present sample reported not smoking and approximately 60% not using alcohol. Differing from the findings of Lanza et al. (2014), overweight and obesity were not associated with smoking in this study. Furthermore, in line with earlier studies by Neumark-Sztainer et al. (1997) and Lanza et al. (2014), and contrary to that of Croezen et al. (2009), overweight and obesity problems were not related to problematic alcohol use. The differences between the findings of these studies might at least partly be explained by cultural aspects such as tobacco and alcohol laws, which vary between countries. In Finland, these laws are relatively strict.

6.2.5. **DIETARY HABITS** (STUDY I SAMPLE: 650 GIRLS, 693 BOYS; STUDY II SAMPLE: 614 GIRLS, 651 BOYS)

In the present study, a normal eating pattern was significantly more prevalent among the males than the females, which is consistent with the fact that both clinical eating disorders and subclinical eating pathology are typically problems of young girls (Neumark-Sztainer, 2000; Chamay-Weber et al., 2005). This study demonstrated a relationship between eating habits and body dissatisfaction in both genders, but it was stronger among the girls. Consistent with earlier studies, the adolescents with abnormal eating habits were more dissatisfied with their bodies than those with normal eating habits (Stice and Shaw, 2002; Johnson and Wardle, 2005). In this study, both girls and boys reporting abnormal eating had a higher body mass than adolescents self-reporting normal eating. According to an earlier follow-up study among adolescents, dieting and unhealthy weight control behaviors predicted greater body mass increases in girls and boys as compared to adolescents with no such behavior (Neumark-Sztainer et al., 2012). More research is needed to investigate whether helping youths substitute dieting and unhealthy weight control behaviors with healthier behavioral patterns causes improvements in weight development (Neumark-Sztainer et al., 2012). Approximately one-fourth of overweight or obese adolescents scored more than 42 points in the EDI, hinting at clinical eating disorder pathology. Among boys with overweight and obesity, the proportion of participants reporting overeating was significantly higher than among boys with normal weight. This difference was not observed in girls, but the reason for this may be that almost one-fifth of the girls with normal weight reported overeating, which most probably is not the case in reality. Girls have been reported more likely than boys to exhibit unhealthy weight control behaviors (Stephen et al., 2014). In this sample, restrictive eating or alternation between restrictive eating and overeating were common among girls with weight problems. An inverse association between meal frequency and the prevalence of obesity and overweight has been found (Mota et al., 2008), but in this study, somewhat surprisingly, there were no differences in attending school lunch or evening dinner between the weight groups.

6.2.6. **SOCIAL RELATIONS** (STUDY II SAMPLE: 614 GIRLS, 651 BOYS)

In contrast to earlier research (Pearce et al., 2002; Strauss and Pollack, 2003), this study revealed no signs that adolescents with overweight or obesity exhibit more problems in having close friends than those with normal weight. However, consistent with the study by Pearce et al. (2002), intimate relationships were significantly less common among them than among their normal-weight peers. Problems in developing intimate relationships associate most probably with problems in sexual self-image. Psychological hindrances in intimate relationships should be explored more detailed in future studies.

6.3. PERCEIVED HEALTH AND GLOBAL FUNCTIONING ASSOCIATED WITH OVERWEIGHT AND OBESITY IN MID-ADOLESCENCE (STUDY II SAMPLE: 614 GIRLS, 651 BOYS; STUDY III SUBSAMPLE: 86 GIRLS, 96 BOYS)

Excess weight in adults has been strongly associated with poorer health and more frequent use of medical services (Burkert et al., 2013). Among Canadian adolescents aged 12 to 17 the odds of reporting very good/excellent health were significantly lower for teens who were daily smokers, episodic heavy drinkers, physically inactive during leisure time, infrequent consumers of fruit and vegetables, or obese, compared with teens which did not have these characteristics (Tremblay et al., 2003). In this study, irrespective of their weight, most 8th graders perceived their health as good. However, the proportion of girls and boys with only average health was significantly higher among those with weight problems than among their normal-weight peers. Moreover, among the boys, the proportion with poor health was significantly higher in those with overweight and obesity than among those with normal weight. Thus, it seems that despite their relatively young age, some mid-adolescents with overweight and obesity problems suffer from subjective health problems related to excess weight. Li et al. (2008) examined the associations between academic performance, cognitive functioning, and increased BMI in a nationally representative sample of children and adolescents aged 8–16 years. The association between BMI and academic performance was not significant after adjusting for parental/familial characteristics. Increased body weight was independently associated with decreased visuospatial organization and general mental ability among youths. When in the present study the global functioning was assessed by the objective researcher, only slight impairments in functioning at home, at school, or with peers were associated with overweight and obesity. However, focusing on boys, those with overweight and obesity exhibited significantly more impairments in every-day functioning than those with normal weight.

6.4. PSYCHIATRIC MORBIDITY ASSOCIATED WITH OVERWEIGHT AND OBESITY IN MID-ADOLESCENCE (STUDY III SUBSAMPLE: 86 GIRLS, 96 BOYS)

Among 8th graders, overweight and obesity were not significantly related to marked psychopathology. Comparing this finding with those of earlier studies is difficult because of variation in the age, gender, and BMI distribution of the samples as well as differences in study methods. In addition, referred samples have been shown to exhibit more psychopathology than non-referred samples (Van Vlierberghe et

al., 2009). In a longitudinal community study among almost 1000 9- to 16-year-old children and adolescents, only chronic obesity (i.e. obesity that had continued from childhood to adolescence) was associated with a mental health disorder: an oppositional defiant disorder in both genders, and depression in boys (Mustillo et al., 2003). In the present sample, only one boy and no girls had oppositional defiant disorder. Depression, on the other hand, was the most prevalent mental health disorder among overweight and obese 8th graders, but no statistically difference in the prevalence of depression was found between them and their normal-weight peers for either gender. Overall, the results of the present study are in line with those of a community study by Lamertz et al. (2002) on among approximately 3000 14- to 24-year-old participants using a computer-based study method in which BMI was not associated with any psychiatric disorder. In a non-referred sample of 73 children and adolescents aged 8 to 18 years (mean age 13.74) with overweight and obesity (mean BMI 27.35) investigated by Van Vlierberghe et al. (2009), 23.3% received one or more psychiatric diagnoses. Both Mustillo et al. (2003) and Van Vlierberghe et al. (2009) also gathered information from care-givers, which was not done in the present study or in that study by Lamertz et al (2002), and may explain the differences in the findings.

6.5. CONCLUSIONS

6.5.1. SUMMARY OF MAIN CONCLUSIONS

In general, psychological well-being was good in most of the overweight and obese adolescents. The psychiatric morbidity of mid-adolescent youngsters with overweight and obesity did not significantly differ from that of their peers with normal weight. The most prevalent psychiatric diagnosis was major depressive disorder, followed by social and specific phobias. The adolescents with excess weight showed only slight impairments in functioning at home, at school, or with peers. In mid-adolescence, the youngsters with overweight and obesity significantly more often revealed abnormal eating behavior, symptoms related to eating disorders, and body image problems, and they significantly more seldom reported experiences of dating than their normal-weight peers.

In self-image, during the one-year follow-up, significantly better development was observed among normal-weight girls in most component scales. Among girls with excess weight, a trend towards better development was also seen, but it was not statistically significant. When girls in separate weight groups were compared, the difference in the development was largest in sexuality and vocational attitudes in favor of normal-weight girls.

6.5.2. OTHER CONCLUSIONS

Overall, mid-adolescent girls showed significantly greater body dissatisfaction than boys. Adolescents with underweight appeared to be most satisfied and those with overweight and obesity most dissatisfied with their bodies. Body dissatisfaction and self-esteem were negatively correlated, and body dissatisfaction was associated with abnormal eating. Inactivity appeared to be an alarming problem among some mid-adolescent girls and boys. Among adolescents with overweight and obesity, self-esteem, smoking and alcohol use, as well as subjective dietary habits, did not differ from those of their normal-weight peers.

6.6. STRENGTHS AND LIMITATIONS

6.6.1. STRENGTHS OF THE STUDY

The study covered as many as 24 secondary schools and the study sample was quite large. Psychiatric diagnoses were based on reliable semi-structured interviews performed by an experienced adolescent psychiatrist. Reliable assessment scales with good psychometric properties were used. Furthermore, most of the BMI values used in the analyses were calculated from objective measurements taken by professional school nurses. The prevalence of overweight and obesity in adolescence varies between 10% and 20% in most European countries (Lissau et al., 2004; Lobstein and Frelut, 2003), and consistently with this, it was about 13% in this study. At the one-year follow-up, the impact of the dropouts (n = 10; 6.0%) was small and did not alter the results or their implications. The study provided new information on the influence of overweight and obesity on the development of self-image in mid-adolescents girls.

6.6.2. LIMITATIONS OF THE STUDY

The overall participation rate in the study schools was approximately 60%. By comparison, the SHPS has repeatedly reported a participation rate of approximately 80%. Consequently, the participation rate of the present study cannot be regarded as excellent, but it can be considered acceptable.

The number of obese adolescents remained relatively low, and the individuals with obesity were combined with those with overweight to form a group of adolescents with excess weight. Those adolescents with the most marked weight problems, with either underweight or obesity, may have refused to participate in the study because of the methodology. It is also possible that adolescents with the most severe psychiatric symptomatology refused to participate in the study, also leaving a possibility of underestimation of the prevalence of psychiatric disorders.

Most psychological assessments of this study were based on self-reports. Such data do not necessarily reflect actual behaviors but subjective ideas or memories of these habits, and adolescents may tend to give normative answers. Furthermore, people with overweight problems tend to report lower intakes of food than in reality and to describe normal eating behavior (Scagliusi et al., 2003). Weight satisfaction as well as health behaviors were measured using single-item questions. Data on the socioeconomic and family status of the participants were lacking. The association between SES and obesity in children and adolescents has been found to be predominately inverse (Shrewsbury and Wardle, 2008).

6.7. IMPLICATIONS FOR FURTHER STUDY

Most published studies focusing on the psychosocial well-being of overweight and obese adolescents have been cross-sectional. Adolescence is, however, a period of rapid psychosocial and cognitive development, which underlines the value of longitudinal follow-up studies in order to better understand the relationship of overweight and obesity with mental health. Studies with long enough follow-ups are needed. The findings clearly indicate that dieting and unhealthy weight control behaviors, as reported by adolescents, predict significant weight gain for most adolescents, while they lead to weight loss and eating disorders for some adolescents (Neumarkt-Sztainer et al., 2012). Further research is needed to explore this difference. Programs aimed at strengthening self-esteem have been developed and their benefits in the prevention of problems with body image and eating, as well as childhood and adolescent obesity, have been studied (O'Dea, 2004). However, more research is needed on this topic, including self-image. Studies aimed at providing better understanding of the factors underlying gender differences in body satisfaction might be helpful in public health initiatives for overweight prevention in children and adolescents (Austin et al., 2009).

6.8. CLINICAL IMPLICATIONS

The present study supports the recommendations of Neumark-Sztainer et al. (2009). A large, five-year longitudinal study identified eating and weight-related issues in a population-based sample of overweight adolescents (Neumark-Sztainer, 2009; Neumark-Sztainer et al., 2009). The study resulted in research-based recommendations for health care providers to prevent obesity and eating disorders among adolescents and their families within clinical, school, or other settings. Their recommendations emphasize the importance of focusing less on weight and more on permanent behavioral change. Unhealthy dieting should be discouraged; instead,

healthy eating and physical activity on a lasting basis should be encouraged. A positive body image should be supported. More frequent, and more enjoyable, family meals should be encouraged. In addition, an assumption is that overweight teens have experienced weight mistreatment, and this issue should be indicated to teens and their families (Neumark-Sztainer et al., 2009).

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